

**DRAFT  
TECHNICAL ASSESSMENT DOCUMENT:**

**FURTHER STUDY MEASURE 8  
FLARES**

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## **I. EXECUTIVE SUMMARY**

As part of the San Francisco Bay Area 2001 Ozone Attainment Plan for the 1-Hour National Ozone Standard, the Bay Area Air Quality Management District (BAAQMD or District) committed to study several activities to determine if additional emission reductions could be achieved and whether implementation of control measures is feasible. The District has the lead for Further Study Measure FS-8 for Pressure Relief Devices (PRDs), Blowdown Systems, and Flares. This technical assessment document (TAD) presents the findings for flares. Separate TADs are being prepared for the other portions of this study. Participation in this study included the California Air Resources Board (ARB), the Environmental Protection Agency (EPA), affected industry, and the public.

### **A. Scope of Technical Assessment**

All process units in refineries are subject to operational upsets that must be controlled in a safe and effective manner. These include instrument failures, loss of cooling water, loss of steam, loss of power and a number of other atypical operating conditions. In order to protect these vessels from overpressure and rupture, these streams are typically released, directly to the atmosphere, to an uncontrolled blowdown system or to a blowdown system controlled by a flare. This technical assessment document deals only with flare systems. Flares provide for the safe disposal of hydrocarbons, both liquid and gases, that are either automatically vented from the process units through pressure relief valves, control valves, or manually drawn from units. Flare systems gather relief flow, separate liquid from vapors, recover any condensable oil and water and discharge the vapors to a flare for combustion and release to the atmosphere. Twenty-eight flares at Bay Area Refineries were reviewed in this study. Information was obtained through site visits, working groups, a monitoring and reporting program, literature searches and vendor interview and presentations.

### **B. Findings**

Based on this assessment, the data shows, depending on the refinery:

- Flare use is greater than expected.
- Flare use can be categorized as follows:
  - Routine everyday flow
  - Planned releases (startup, shutdown, vessel depressurization etc.)
  - Emergency releases
- Flares are routinely used as gas disposal systems and to comply with fuel gas H<sub>2</sub>S standards.
- The emission inventory for these sources should be updated.
- Additional data and analysis should be evaluated for possible rulemaking.
- Combustion efficiency has a large impact on emissions and needs further study.
- District has the authority to require monitoring without further rule development.

## **II. INTRODUCTION**

This chapter provides background information on the need to conduct a Technical assessment of refinery flare systems. A description of existing District rules and regulations applicable to refinery flares is also provided. This chapter is the flare system assessment portion of Further Study Measure FS-8, Refinery Pressure Vessels, Blowdown Systems and Flares. Separate assessments are being prepared for PRD's and uncontrolled blowdown systems.

### **A. Background**

On November 1, 2001, the ARB approved the 2001 Plan as a revision to the State Implementation Plan (SIP). The 2001 Plan contains control strategies with seven new stationary source control measures, five new transportation control measures, and eleven further-study measures. Five of the stationary source control measures, and 4 of the further-study measures concern refinery operations. The new measures and on-going programs will provide 271 tons per day of combined volatile organic compound (VOC) and oxides of nitrogen (NOx) emission reductions between 2000 and 2006.

One of the further-study measures identified in the 2001 Plan is Further Study Measure 8 (FS-8), Refinery Pressure Vessels, Blowdown Systems and Flares. This technical assessment document addresses emissions from flares.

Flares provide for the safe disposal of hydrocarbons, liquid and gases, that are either automatically vented from the process units through pressure safety valves, control valves, or manually drawn from units. These systems (Figure 1) gather relief flow, separate liquid from vapors, recover any condensable oil and water and discharge the vapors through a flare to the atmosphere. This document will determine current emissions and the potential to reduce emissions through enhanced enforcement and additional control requirements and/or expansion of the scope of the current regulations. Further study will evaluate current industry practices and consider the feasibility of requirements to implement prevention measures to minimize or eliminate routine flaring.

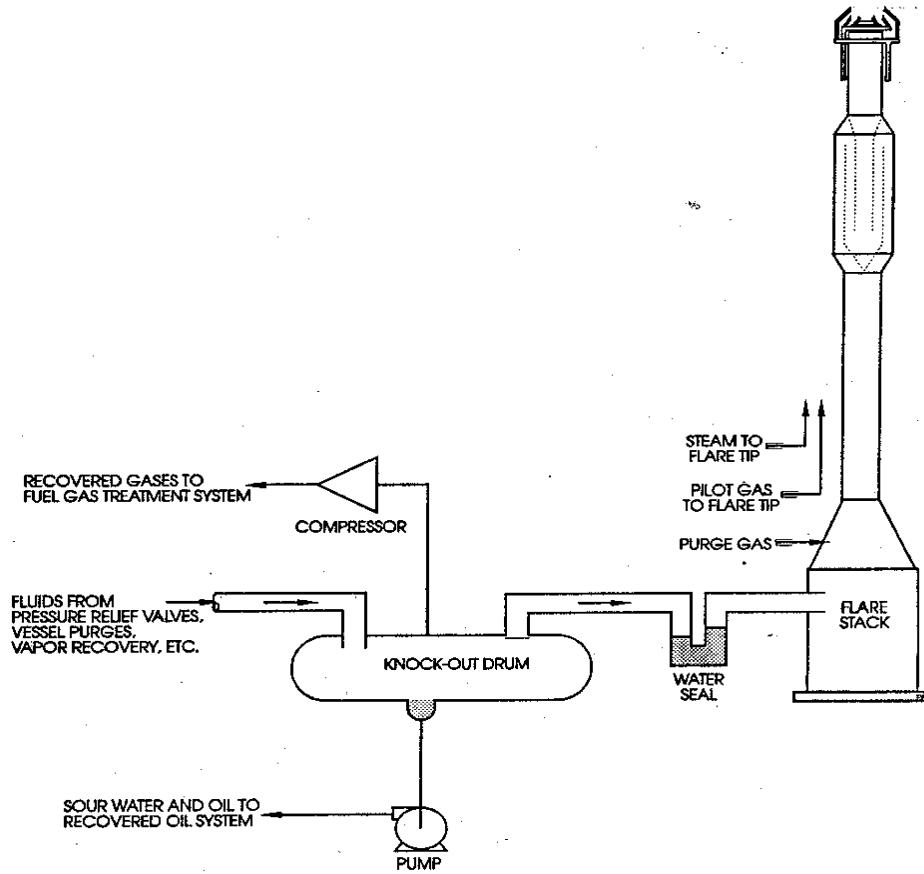


Figure 1. Typical Flare System CARB

## B. Review of Regulations

This section summarizes other regulatory requirements, both California and federal, that apply to refinery flare systems. Table 1 below summarizes the current regulatory requirements for flares.

Table 1: Regulatory Requirement Other California AQMD's and EPA

	Regulation	Control/Performance Requirements	Monitoring Requirements	Minimization Plan	Emission Limitations
	Title V	Specific to facility and source	Yes	No	Throughput limits
SCAQMD	1118	TBD	Gas flow, heat and sulfur content	TBD	TBD
SJAPCD	4311	Open Air Flares <5psig must meet 60.18	For flares used during an emergency, record of the duration of flare operation, amount of gas burned, and the nature of the emergency situation.	No	Ground level enclosed flares only
SBAPCD	359	Heating value, exit velocity, automatic ignition system	Presence of a flame	Yes	sulfur compounds in excess of 15 grains per 100 cubic feet (239 ppmv) in the Southern Zone of Santa Barbara County or 50 grains per 100 cubic feet (796 ppmv) in the Northern Zone of Santa Barbara County; smokeless;
EPA	40CFR60.18	Flame present at all times, heat content, maximum tip velocity, composition	Presence of flame, heating value	No	Smokeless capacity

Within the District, when an emissions source is installed or an existing source is modified, the District's NSR requirements must be met. NSR requires the use of the most stringent emission control device or technique, which is known as Best Available Control Technology (BACT). BACT is required for new or modified sources that have the potential to emit 10 pounds per day or more of VOC, carbon monoxide, oxides of nitrogen, particulate matter, and sulfur dioxide. Control efficiency of 98 and 98.5 are required as BACT.

### C. Potential Control Strategies

This assessment, suggests two types of potential control strategies to control emissions from flares. These can be grouped into two types:

- Equipment Control
- Prevention

Equipment control strategies are those that require the installation of new equipment or devices, or can include physical changes to the flare system. Potential engineering control strategies applicable for refinery flare systems include:

- installation of additional flare gas compressors to collect gases and prevent flaring
- improvement of the reliability of the existing flare gas compressors
- addition of gas storage capacity to hold flare gas
- balance the use of combustion devices, flare gas and natural gas consumption

Pollution Prevention strategies are designed to reduce the source of the VOC emissions (pollution prevention) through changes to the operation of the refinery, as opposed to controlling the emissions with tail end equipment. These may include:

- installing redundant equipment,
- devising inspection and maintenance programs to minimize emissions from all sources.

#### **D. Cost and Cost-Effectiveness**

Equipment control strategy costs can vary greatly depending on the specifics of the Bay Area refinery. Installing compressors cost between \$1,000,000 - \$8,000,000 per unit depending on the size of the compressor. In addition, additional storage capacity or facilities to use the collected gas may need to be constructed and the associated costs need to be evaluated.

The costs of a process control strategy are difficult to determine. This is because this strategy requires improvements in the way refineries are presently operated. Any routine venting to the flare needs to be evaluated and minimized. Shutdowns and startup of units at each refinery need to be evaluated to ensure that good refinery, operating and air pollution control practices to minimize emissions are used. All routine ventings need to be identified and if possible eliminated. Each refinery is unique and requires its own analysis. In many cases, these changes that reduce flaring could result in cost savings, in addition to emission reductions. Because of the difficulties in quantification of the costs, and the significant variability between refineries, the potential costs for process control strategies, and their associated cost-effectiveness, were not calculated as part of this TAD.

### **III. FINDINGS**

This chapter summarizes the findings of this TAD.

#### **A. Emissions**

Flare emissions are difficult to characterize. The use of average or typical emissions does not accurately depict the impact of flare emissions on air quality. One way to evaluate the air quality impact of flare emissions is to calculate emissions on a day when there is poor air quality. The staff calculated emissions from flares during two periods in 2000 when the federal ozone standard was exceeded (June 11 to June 16 and July 27 to August 3). These emissions of volatile organic compounds (VOC) from flares will be included in the modeling inventory. This information will be used in the development of the 2004 ozone plan.

The District emission inventory for flare systems at petroleum refineries should be updated. In general, these changes would increase the VOC emissions from flare systems. This change would increase the average emission inventory from 13 tons per day to about 22 tons per day<sup>1</sup>.

#### **B. Control Measure Development**

##### **1. Monitoring**

The District presently has the authority to require monitoring under Regulation 1, Section 521 that states:

**Monitoring May Be Required:** The APCO may require the installation of suitable instruments to monitor continuously the nature, quantity and opacity of any air pollutant controlled by District regulations where there is a reason to believe such emissions are in potential violation of such regulations.

Therefore, the requirements in the 2001 Ozone Control Measure 15 (Flare Monitoring) could be satisfied by implementing the requirements in Regulation 1, Section 521 rather than embankment on rulemaking. The use of existing authority has another advantage of the ability to tailor the monitoring to the specifics of each refinery.

##### **2. Emissions Reduction Potential**

The fundamental premise of flares is to limit their use to extraordinary situations. Therefore, further development of control strategies need to be considered in the areas of prevention of episodic releases and elimination of planned and routine releases to flares.

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<sup>1</sup> Based on all data submitted by each facility, except Chevron and calculated assuming 75% VOC with a molecular weight of 44 and a combustion efficiency of 98%

A review of the historical data indicated that at one facility, fuel gas was diverted to the flare on 21 occasions in a single year in order to comply with fuel gas standards. An investigation, policy or rule clarification is recommended to explicitly define that flares are to be used only for extraordinary situations. Current District and Federal requirements do not allow the use of flares as routine disposal devices.<sup>2</sup>

### **C. Combustion Efficiency**

Combustion efficiencies (CE) for open-air flares are difficult to precisely determine. In practice, they vary greatly because of the wide range of flows, gas composition and conditions they are operated. No useful performance tests of flares at actual operating conditions were identified. Because flows to flares are large, CE has a significant impact on estimates of VOC emissions. A slight change in the assumed CE will have a dramatic effect on the estimated emissions. For example, if one facility assumes 99.5% CE and reports 1 ton per day of VOC emissions, another facility could assume 98% and report 4 tons per day or 95% and report 10 tons per day for the same emissions. Flare performance has a large impact on actual emissions. Additional efforts to verify CE under actual operating conditions should be undertaken.

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<sup>2</sup> EPA300-N-00-014 ENFORCEMENT ALERT, VOLUME 3, NUMBER 9, OCTOBER 2000

## IV. SUPPORTING DATA AND DISCUSSION

This study evaluates the feasibility, cost, and safety of emission reductions that would come from reducing flows to the flare system and from increasing gas recovery capacity and flare efficiency.

### A. Emissions

VOC emissions are dependent on a number of factors such as volumetric flow, velocity, gas composition, energy content, and cross winds. Studies show that wind speed can dramatically affect combustion efficiency. Efficiency drops approximately by the cube of the speed. For example if the wind speed doubles, the emissions increase by a factor of eight. High flare exit velocities reduce the wind effect. Flare efficiency dramatically decreases as the energy content of the flare gas decreases. Field measurements found efficiencies as low as 62%.<sup>3</sup>

Typically wind speeds at the Bay Area refineries range between 8 and 18 miles per hour (2 to 6 meters per second). Flare tip diameters at the Bay Area refineries range between 4 to 7 feet.

In order to estimate emissions, the District requested monthly reports of daily emissions, immediate reporting of flows greater than 1.0 MMSCF and 1 year of historical data. A number of assumptions were made as indicated in the appendix and emissions were estimated for the highest day and an average was calculated over all the available data. Unless otherwise noted in the appendix, the average daily emissions assumes an emission factor of 98%, a VOC content of 75%, and a molecular weight of 44 pounds per mole. The analysis of the data is summarized as follows.

	Date of Highest Day	VOC Emissions, Highest Day	VOC Emissions, Average Daily
Tesoro	3/29/01	120 tons	13 tons
Phillips	7/10/02	134 tons	4 tons
Shell	6/4/02	11 tons	3 tons
Valero	6/3/02	40 tons	2 tons
			22 tons total*

\* Not including Chevron

Chevron does not have adequate monitoring to make an assessment. Chevron does not have monitors that directly measure flow to the flare. Historical data was received on 12/2/02 and is currently being analyzed.

An initial survey of existing flares identified the following systems for study. Table 2 is a summary of each flare system.

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<sup>3</sup> Efficiency Measurements of Flares in a Cross Flow, M.R. Johnson, O. Zastavniuk, D.J. Wilson and L.W. Kostiuk, Combustion and Environmental Group, Department of Mechanical Engineering, University of Alberta, Edmonton, Alberta, Canada, T6G 2G8

**Table 2: Flare System Summary**

**Chevron**

<b>Flare</b>	<b>Design Capacity</b>	<b>Comments</b>
LSFO High Level	400,000 lb/hr 605,000 btu/hr	One compressor with a capacity of 2.4 MMSCFD services these two flares. Two compressors each with a capacity of 2.0 MMSCFD serve as backup.
Waste Gas Flare	1,100,000 lb/hr 3,000,000 btu/hr	
South Isomax	3,585 bbl/hr 2,315,000 btu/hr	Two compressors each with a capacity of 4.0 MMSCFD service these six flares.
North Isomax	3,585 bbl/hr 2,315,000 btu/hr	
FCC Flare	2,540 bbl/hr 4,515,000 btu/hr	
Alkane Flare	2,315,000 btu/hr	
Alky Flare	900 bbl/hr 31MM btu/hr	
Lube Flare	500,000 lb/hr 341,000 btu/hr	
LSFO Low Level	50,000 lb/hr	This flare is disconnected and not used.

Design capacity from District records

**Shell**

<b>Flare</b>	<b>Design Capacity</b>	<b>Comments</b>
LPG Loading Flare	1,048,000 btu/hr	No gas recovery compressor
LOP Auxiliary Flare	1,048,000 btu/hr 111,400 lbs/hr	Two compressors each with a capacity of 1.5 MMSCFD service these flares.
LOP Main Flare	1,600,000 btu/hr 222,000,000 ft <sup>3</sup> /hr	
FXG Flare	10,080MM btu/hr	No gas recovery compressor
HC Flare	25MM btu/hr	No gas recovery compressor
Delayed Coking	4,000,000 btu/hr	Two compressors each with a capacity of 4 MMSCFD service these flares.
VRS #2	309,000,000 btu/hr	1.6 MMSCFD compressor capacity
VRS#3	108,000,000 btu/hr	2.1 MMSCFD compressor capacity
VRS#1	108,000,000 btu/hr	1.1 MMSCFD compressor capacity

**Phillips**

<b>Flare</b>	<b>Design Capacity</b>	<b>Comments</b>
C-1 Flare	6,600,000 btu/hr 14,050,000,000 btu/hr	3.12 MMSCFD compressor capacity
C-602 Flare	31,000,000 btu/hr	4.5 MMSCFD compressor capacity

**Tesoro**

<b>Flare</b>	<b>Design Capacity</b>	<b>Comments</b>
East Air Flare	950,000,000 btu/hr	One compressor with a capacity of 2.0 MMSCFD services these six flares.
Tank 691 Safety	30,000 lbs/hr	
North Coker Flare	100,000 lbs/hr	
South Coker Flare	100,000 lbs/hr	
Emergency Flare	9,770,000,000 btu/hr	
West Air Flare	950,000,000 btu/hr	
Ammonia Flare	2,670,000,000 btu/hr	No gas recovery compressor

**Valero**

<b>Flare</b>	<b>Design Capacity</b>	<b>Comments</b>
Acid Gas Flare	Not available	No gas recovery compressor
Butane Flare	16,000 lbs/hr	No gas recovery compressor
South Flare	12,000,000 lbs/hr	6.0 MMSCFD compressor capacity
North Flare	Not available	6.0 MMSCFD compressor capacity

The appendix contains data from the requested 3-month trial period and 1 year of historical data.

## B. Emission Data

In order to estimate emission from flares, the District requested monthly reports of daily emissions, immediate reporting of flows greater than 1MMSCF and 1 year of historical data. The initial assessment identified the quality of the existing monitoring systems. The monitoring systems at each of the facilities ranged from state of the art monitoring, ultrasonic, to no monitoring, using engineering calculations to estimate emissions. The initial strategy in this TAD was to investigate all reported flaring events greater than 1MMSCF to determine the cause, the prevention and the emission consequences. Because of the frequency of ventings and the resources available to conduct the investigations, a limited number of ventings were actually investigated. A summary of the data as reported is provided in Table 3. The data from the 3-month trial period has been categorized by cause.

**Table 3: Emission Estimates from Causal Factors for Flaring Incidents in the Bay Area**

Month of June 2002						
	Pounds of Total Hydrocarbon Occurrence of Events $\geq$ 1MMSCF					Emission Estimates As Reported
	Chevron	Phillips <sup>1</sup>	Shell	Tesoro <sup>2</sup>	Valero	Hydrocarbon (lbs)
Startup/Shutdown	0	10874	0	3053	0	13927
Maintenance	1506	0	0	3053	0	4559
Human Factor	0	0	0	3053	0	3053
Equipment failure	884	0	0	3053	27334	31271
Operational	0	0	9713	2874	3038	15625
Unknown	0	0	0	2874	0	2874
<b>Total</b>	<b>2390</b>	<b>10874</b>	<b>9713</b>	<b>17960</b>	<b>30372</b>	<b>71309</b>

<sup>1</sup>Phillips reported emissions using a combustion efficiency of 98.5% all other facilities used 99.5%.

<sup>2</sup>Tesoro reported emissions above 1MMSCF on every day. It was not possible to distinguish individual events

Month of July 2002						
	Pounds of Total Hydrocarbon Occurrence of Events $\geq$ 1MMSCF					Emission Estimates As Reported
	Chevron	Phillips <sup>1</sup>	Shell	Tesoro <sup>2</sup>	Valero	Hydrocarbon (lbs)
Startup/Shutdown	0	8182	0	6955	7876	23013
Maintenance	2113	0	0	6955	0	9068
Human Factor	0	0	0	6955	0	6955
Equipment failure	719	1672	0	6955	0	9346
Operational	0	2258	2522	6545	2654	13979
Unknown	0	1314	0	6545	1641	9500
<b>Total</b>	<b>2832</b>	<b>13426</b>	<b>2522</b>	<b>40910</b>	<b>12171</b>	<b>71861</b>

<sup>1</sup>Phillips reported emissions using a combustion efficiency of 98.5% all other facilities used 99.5%.

<sup>2</sup>Tesoro reported emissions above 1MMSCF on every day. It was not possible to distinguish individual events

Month of August 2002						
	Pounds of Total Hydrocarbon Occurrence of Events $\geq$ 1MMSCF					Emission Estimates As Reported
	Chevron	Phillips <sup>1</sup>	Shell	Tesoro <sup>2</sup>	Valero	Hydrocarbon (lbs)
<b>Startup/Shutdown</b>	0	21776	0	5127	0	26903
<b>Maintenance</b>	0	0	459	5127	0	5586
<b>Human Factor</b>	0	0	0	5127	0	5127
<b>Equipment failure</b>	0	0	0	5127	0	5127
<b>Operational</b>	0	0	1549	4826	2187	8562
<b>Unknown</b>	0	0	0	4826	0	4826
<b>Total</b>	0	21776	2008	30160	2187	56131

<sup>1</sup>Phillips reported emissions using a combustion efficiency of 98.5% all other facilities used 99.5%.

<sup>2</sup>Tesoro reported emissions above 1MMSCF on every day. It was not possible to distinguish individual events

Figure 2 shows the total VOC emissions per cause for each month of the 3-month trial period. Because staff was unable to thoroughly investigate a sufficient number of these events, the characterization is limited to the description provided by the facility. The descriptions provided were not detailed enough to make a proper assessment of the underlying cause(s).

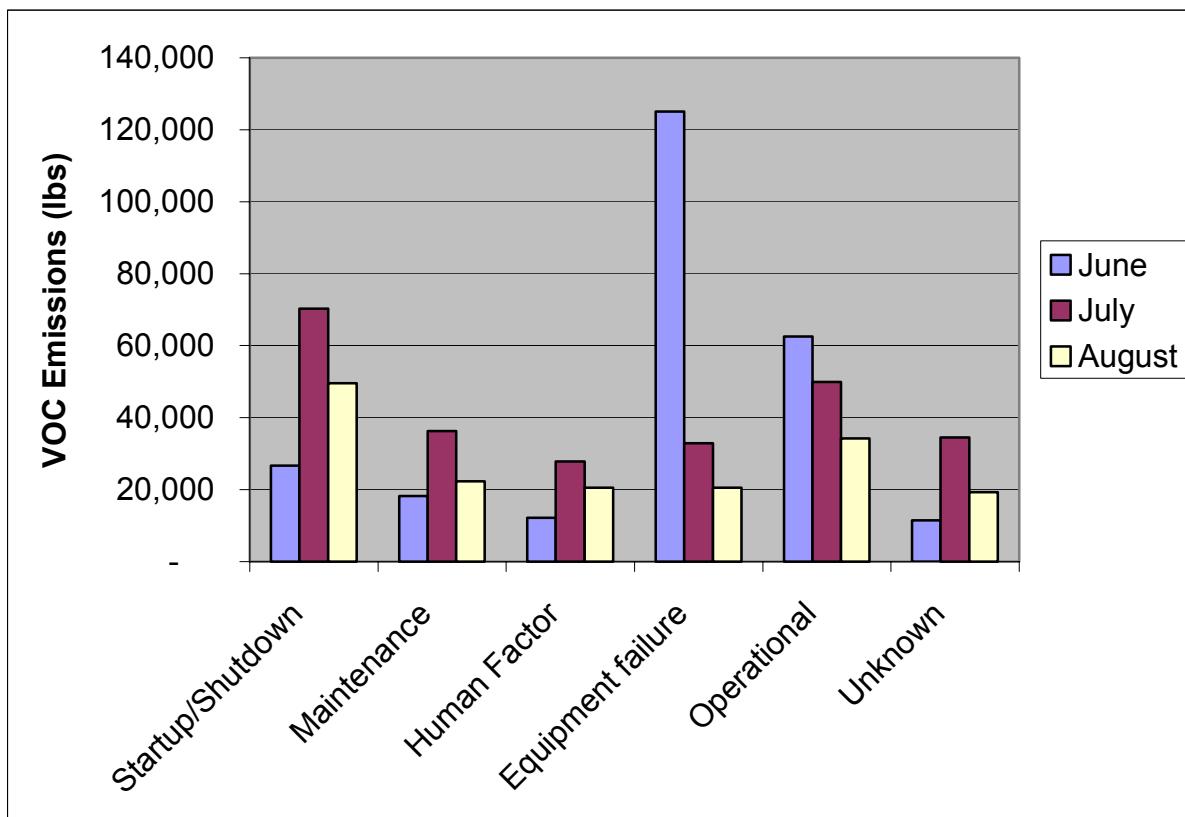


Figure 2: VOC Emissions by Cause

### **C. Discussion Of Published Studies**

The most quoted study on flares comes from EPA, which gives flare efficiencies greater than 98%. This study looked at flare tip diameters from 1.5 inches to 12 inches during quiescent conditions or nearly quiescent conditions burning purely gaseous fuels.

Combustion efficiencies will always be controversial because of the difficulty associated with making accurate field measurements. Results from the Alberta Research Council (ARC), which took field measurements from flares, were in stark contrast to EPA and other flare studies. Not only did the ARC find efficiencies as low as 62% but the study identified measurable quantities of 150 VOC and poly-nuclear aromatic hydrocarbons (PAH).

No reliable performance tests of flares at actual operating conditions were identified. A number of studies were reviewed for combustion efficiencies. They indicated combustion efficiencies ranged between 40% and 99.8%. A synopsis of some of the key studies is provided in the appendix.

## **V. APPENDICES**

## **Appendix 1: Monthly Reported Data**

### **A. Chevron**

CHEVRON	DATE	CAUSE/COMMENTS	SO2	H2S	HYDROCARBON			VOLUME		
			(lbs)	(%)	(lbs NMHC @ 99.5%)	NO2	NO	(MMSCFD)	SOx (lbs)	H2S (lbs)
LSFO Flare - S6010	6/5	Leaking PSV on FGR compressor (K-1171) reduced FGR compressors capacity.	66.00	0.4	81 NMHC, 113 HC, 98.5% eff	0.2	14.60	2.00	66	0.7
LSFO Flare - S6010	6/6	Relay on FGR compressor (K-3950) keep tripping off. Time is 8 periods summed together.	35	0.1	42 NMHC, 59 HC, 98.5% eff	0.1	7.8	1 - 2	35	0.4
FCC Flare - S 6016	6/6	Leaking PSV in RLOP system; low confidence in flow estimation	0	0	97 NMHC, 124 HC, 98.5% eff	0.1	7.3	0.7	0	0
DNR K1171	6/8	Compressor out of service								
FCC Flare - S 6016	6/9	Leaking PSV in RLOP system; low confidence in flow estimation	37	0.5	71 NMHC, 76 HC, 98.5% eff	0.1	4.4	0.7	37	0.4
FCC Flare - S 6016	6/11	Replace PSV in FGR compressors; each compressor down one at a time while PSV fixed	0	0	28 NMHC, 36 HC, 98.5% eff	0.1	2.9	0.7	0	0
	6/13	Compressor maintenance?								
S#6012,-13,-16,&-39	6/17-6/18	Planned maintenance on compressors	7566.80	0.0-3.5	1506.30	4.50	290.90	0.9-2.5		
South Flares	6/18	Leaking PSV in H2 Plant; low confidence in flow estimation	8.00	0.05	27 pounds HC	0.10	4.50	0.25	8	
S#6010	6/29-6/30	Power supply problems to the compressor. Mechanical problems on a vent gas recovery compressor.	98.80	0.05	250.10	1.00	75.30	0.25-2.3		
S#6010	6/30-7/1	Power supply problems to the compressor. Mechanical problems on a vent gas recovery compressor.	175.50	0.05	339.30	2.00	133.80	1.5-2.5		
S#6012,-13,-16, & -39	7/1-7/2	Mechanical breakdown due to overheating caused by suction line plugging	3494.30	0.0-2.4	347.20	1.30	80.30	0.6-1.2		
S#6010	7/1-7/2	Compressor partially offline due to power supply problems and mechanical problems as above.	146.80	0.05	371.50	1.70	111.90	1.0-2.2		
S#6012,-13,-16, & -39	7/2	Mechanical breakdown due to overheating caused by suction line plugging	3972.10	0.0-1.3	331.10	2.20	138.10	0.6-1.2		

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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CHEVRON				SO2	H2S	HYDROCARBON			VOLUME		
SOURCE NAME & NUMBER	DATE	CAUSE/COMMENTS		(lbs)	(%)	(lbs NMHC @ 99.5%)	NO2	NO	(MMSCFD)	SOx (lbs)	H2S (lbs)
S#6012,-13,-16, & -39	7/3	Mechanical breakdown due to overheating caused by suction line plugging		18570.00	0.0-9.1	463.00	1.70	85..2	0.6-1.2		
S#6012,-13,-16, & -39	7/4	Mechanical breakdown due to overheating caused by suction line plugging		8195.70	0.0-9.1	380.90	1.00	62.50	0.6-1.2		
S#6012,-13, &-16	7/8	Mechanical breakdown due to overheating caused by suction line plugging		1812.30	0.0-1.3	253.60	1.50	101.50	0.1-0.6		

NOTE: Effective with the July summary Chevron used a new reporting format. This sheet reflects the new format.

Chevron											
Event Date	Cause of event	Flare Name	Release Volume	Total Volume	Hydrogen	H2S	Inerts	Hydrocarbon			
			(MMSCF)	(MMSCF)	(MMSCF)	(MMSCF)	(MMSCF)	(MMSCF)			
07/01/2002	NY FGR compressor shut down due to high temp	FCC	0.1		0.024	0	0.006				0.07
		SISO	0.6		0.15	0.002	0.076				0.372
		NISO	0.26		0.184	0.004	0.036				0.04
		RLOP	0.53	1.49	0.237	0.032	0.047				0.211
07/01/2002	FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.	D&R	1		0.7	0.001	0.1				0.2
		D&R	0.09		0.062	0.001	0.009				0.018
		D&R	0.15		0.104	0	0.015				0.03
		D&R	0.33		0.229	0	0.033				0.066
		D&R	0.14		0.096	0	0.014				0.028
		D&R	0.07	1.77	0.05	0	0.007				0.014

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Chevron								
Event Date	Cause of event	Flare Name	Release Volume (MMSCF)	Total Volume (MMSCF)	Hydrogen (MMSCF)	H2S (MMSCF)	Inerts (MMSCF)	Hydrocarbon (MMSCF)
07/02/2002	FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.	D&R	0.2		0.143	0	0.02	0.041
		D&R	0.08		0.054	0	0.008	0.015
		D&R	0.01		0.006	0	0.001	0.002
		D&R	0.01		0.006	0	0.001	0.002
		D&R	0.01	0.31	0.006	0	0.001	0.002
07/02/2002	NY FGR compressor repairs and modifications to prevent plugging	RLOP	1.2		0.54	0.072	0.108	0.48
		SISO	0.6		0.15	0.002	0.076	0.372
		FCC	0.1		0.024	0	0.006	0.07
		NISO	0.6	2.5	0.42	0.008	0.082	0.09
07/03/2002	FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.	D&R	0.09		0.064	0	0.009	0.018
		D&R	0.02		0.011	0	0.002	0.003
		D&R	0.1	0.21	0.073	0	0.01	0.021
07/03/2002	NY FGR compressor repairs and modifications to prevent plugging	NISO	0.6		0.42	0.008	0.082	0.09
		SISO	0.6		0.15	0.002	0.076	0.372
		FCC	0.1		0.024	0	0.006	0.07
		RLOP	1.2	2.5	0.54	0.072	0.108	0.48
07/04/2002	FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.	D&R	0.5	0.5	0.35	0	0.05	0.1

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Chevron								
Event Date	Cause of event	Flare Name	Release Volume (MMSCF)	Total Volume (MMSCF)	Hydrogen (MMSCF)	H2S (MMSCF)	Inerts (MMSCF)	Hydrocarbon (MMSCF)
07/04/2002	NY FGR compressor repairs and modifications to prevent plugging	FCC	0.1		0.024	0	0.006	0.07
		SISO	0.6		0.15	0.002	0.076	0.372
		RLOP	0.47	1.4	0.211	0.028	0.042	0.187
07/05/2002	FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.	D&R	0.33	0.33	0.233	0	0.033	0.067
07/05/2002	NY FGR compressor repairs and modifications to prevent plugging	SISO	0.6		0.15	0.002	0.076	0.372
		FCC	0.1	0.7	0.024	0	0.006	0.07
07/06/2002	FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.	D&R	0.38	0.38	0.263	0	0.037	0.075
07/06/2002	NY FGR compressor repairs and modifications to prevent plugging	FCC	0.1		0.024	0	0.006	0.07
		SISO	0.6	0.7	0.15	0.002	0.076	0.372
07/07/2002	FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.	D&R	0.79		0.554	0	0.079	0.158
		D&R	0.01	0.8	0.009	0	0.001	0.003
07/07/2002	NY FGR compressor repairs and modifications to prevent plugging	FCC	0.1		0.024	0	0.006	0.07
		SISO	0.6	0.7	0.15	0.002	0.076	0.372

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Chevron								
Event Date	Cause of event	Flare Name	Release Volume (MMSCF)	Total Volume (MMSCF)	Hydrogen (MMSCF)	H2S (MMSCF)	Inerts (MMSCF)	Hydrocarbon (MMSCF)
07/08/2002	FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.	D&R	0.75	0.75	0.525	0	0.075	0.15
07/08/2002	NY FGR compressor repairs and modifications to prevent plugging	SISO	0.6		0.15	0.002	0.076	0.372
		FCC	0.1		0.024	0	0.006	0.07
		NISO	0.56	1.26	0.393	0.008	0.076	0.084
07/09/2002	FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.	D&R	0.38	0.38	0.263	0	0.037	0.075
07/09/2002	NY FGR compressor repairs and modifications to prevent plugging	SISO	0.29		0.072	0.001	0.036	0.18
		NISO	0.5		0.35	0.007	0.068	0.075
		FCC	0.04	0.83	0.01	0	0.003	0.03
07/10/2002	FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.	D&R	0.42	0.42	0.292	0	0.041	0.083
07/12/2002	K-1171 shutdown due to hot valve.	D&R	0.003	0.003	0.002	0	0	0.001
07/12/2002	Unknown	D&R	0.075	0.075	0.053	0	0.007	0.015
07/17/2002	Loss of K-1900 due to low lube oil pressure.	RLOP	0.036		0.016	0.002	0.003	0.014
		SISO	0.045		0.011	0	0.006	0.028
		FCC	0.001		0	0	0	0.001
		NISO	0.004	0.086	0.003	0	0.001	0.001

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Chevron								
Event Date	Cause of event	Flare Name	Release Volume (MMSCF)	Total Volume (MMSCF)	Hydrogen (MMSCF)	H2S (MMSCF)	Inerts (MMSCF)	Hydrocarbon (MMSCF)
	Shutdown D&R FGR for PSV removal on K-900	D&R	0.02	0.02	0.015	0	0.002	0.004
08/05/2002	After 20 Plant startup, the gas to K-1900 became lighter than normal and the machine vented to relief until moves could be made to stabilize it.	RLOP	0.01	0.01	0.005	0.001	0.001	0.005
08/06/2002	NY FGR pressured up due to PRD in RLOP leaking	FCC	0.11	0.11	0.025	0	0.006	0.074
08/07/2002	NY FGR pressured up due to PRD in RLOP leaking	FCC	0.15	0.15	0.037	0	0.009	0.107
08/08/2002	NY FGR pressured up due to PRD in RLOP leaking	FCC	0.04		0.01	0	0.002	0.029
	NY FGR pressured up due to PRD in RLOP leaking	SISO	0.04	0.08	0.01	0.0002	0.005	0.026
08/17/2002	SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed	SISO	0.3	0.3	0.075	0.001	0.038	0.186
08/18/2002	SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed	SISO	0.24		0.06	0.001	0.03	0.149
	SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed	SISO	0.3	0.54	0.075	0.001	0.038	0.186

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Chevron								
Event Date	Cause of event	Flare Name	Release Volume (MMSCF)	Total Volume (MMSCF)	Hydrogen (MMSCF)	H2S (MMSCF)	Inerts (MMSCF)	Hydrocarbon (MMSCF)
08/19/2002	SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed	SISO	0.24		0.06	0.001	0.03	0.149
	SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed	SISO	0.3	0.54	0.075	0.001	0.038	0.186
08/20/2002	SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed	SISO	0.24		0.06	0.001	0.03	0.149
	SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed	SISO	0.3	0.54	0.075	0.001	0.038	0.186
08/21/2002	SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed	SISO	0.24		0.06	0.001	0.03	0.149
	SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed	SISO	0.3	0.54	0.075	0.001	0.038	0.186
08/22/2002	SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed	SISO	0.24		0.06	0.001	0.03	0.149
	SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed	SISO	0.22	0.46	0.055	0.001	0.027	0.135

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Chevron								
Event Date	Cause of event	Flare Name	Release Volume (MMSCF)	Total Volume (MMSCF)	Hydrogen (MMSCF)	H2S (MMSCF)	Inerts (MMSCF)	Hydrocarbon (MMSCF)
08/27/2002	Vent gas recovery compressor K-1171 taken out of relief service	D&R	0.03	0.03	0.022	0	0.003	0.006
June:								
July:	VOCs: Using 99.5% destruction efficiency: 351 tons X(1-.995)= 1.76 Tons VOCs							
	From Events: 6.75 MMSCF= <b>186 tons</b> VOCs							
	Total with pilot/purge 12.75 MMSCF=351 tons VOCs							
August:	VOCs: Using 99.5% destruction efficiency: 222 tons X(1-.995)= 1.11 Tons VOCs							
	From Events: 2.06 MMSCF= <b>57 tons</b> VOCs							
	Total with pilot/purge 8.06 MMSCF=222 tons VOCs							

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TO REDUCE EMISSIONS FROM FLARES**

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## B. Tesoro

Tesoro					Volume	HHV	H2S	Mol. Wt	NOx	Nox	SOx	Hydrocarbon
SOURCE NAME & NUMBER		RELEASE DATE & TIME		CAUSE/COMMENTS	(MMSCFD)	(BTU/SCF)	(Mole %)	(lbs/mole)	(lbs/mbtu)	(lbs/day)	(lbs/day)	(lbs/day NMHC @ 99.5%)
East Air Flare		12/10/2001 - 12/13/2001		Double Outage at Sulfur Plant due to leak in exchanger in acid plant & gasket leak in SRU	4.50	864	1.00	20 org frac				
East, West, 2 Steam flares (4 total)		12/21/2001	all day	Startup of FCC	5.00	684	0.30	25 org frac				
East, West, 2 Steam flares (4 total)		01/03/2002	all day	Upcoming shutdown of #5 gas plant requiring rerouting of streams	7.50	854	0.10	26 org frac				
East, West, 2 Steam flares (4 total)		01/09/2002	all day	Shutdown of #5 gas plant	23.40	910	1.00	39 org frac				
		01/22/2002										
		01/23/2002										
Sulfur Plant		01/26/2002	1355									
East, West, 2 Steam flares (4 total)		03/16/2002	5 hr incident, caks for 24 hours	Plugged filter in HDS caused excess sulfur in fuel gas so gas flared rather than burned	36.70	688	0.20	34 org frac				
				Incident lasted 5 hours, calculations for 24 hours								
		04/07/2002	2147									
East, West, 2 Steam flares (4 total)		06/01/2002			5.61	839	1.68	33	0.068	320	15940	960
		06/02/2002			5.72	839	1.68	33	0.068	320	16240	980
		06/03/2002			6.25	839	1.68	33	0.068	360	17760	1060
		06/04/2002			7.28	839	1.68	33	0.068	420	20680	1240
		06/05/2002			7.14	839	1.68	33	0.068	400	20280	1220
		06/06/2002			4.78	839	1.68	33	0.068	280	13580	820
		06/07/2002			5.99	839	1.68	33	0.068	340	17020	1020
		06/08/2002			9.21	839	1.68	33	0.068	520	21680	1560

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
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Tesoro					Volume	HHV	H2S	Mol. Wt	NOx	Nox	SOx	Hydrocarbon
SOURCE NAME & NUMBER		RELEASE DATE & TIME	CAUSE/COMMENTS		(MMSCFD)	(BTU/SCF)	(Mole %)	(lbs/mole)	(lbs/mbtu)	(lbs/day)	(lbs/day)	(lbs/day NMHC @ 99.5%)
		06/09/2002			11.85	839	1.68	33	0.068	680	33640	2020
		06/10/2002			18.48	839	1.68	33	0.068	1060	5252	3140
		06/11/2002			11.35	839	1.68	33	0.068	640	32260	1920
		06/12/2002			7.74	839	1.68	33	0.068	440	22000	1320
		06/13/2002			9.65	839	1.68	33	0.068	560	27420	1640
		06/14/2002			5.45	839	1.68	33	0.068	320	15480	920
		06/16/2002			4.85	839	1.68	33	0.068	280	13780	820
		06/17/2002			4.83	839	1.68	33	0.068	280	13720	820
		06/18/2002			7.90	839	1.68	33	0.068	320	15500	920
		06/19/2002			4.80	839	1.68	33	0.068	440	22320	1340
		06/20/2002			6.10	839	1.68	33	0.068	280	13540	820
		06/21/2002			5.00	839	1.68	33	0.068	360	17460	1040
		06/22/2002			7.30	839	1.68	33	0.068	280	14240	860
		06/23/2002			11.50	839	1.68	33	0.068	420	20860	1240
		06/24/2002			7.40	839	1.68	33	0.068	660	32720	1960
		06/25/2002			6.70	839	1.68	33	0.068	420	21140	1260
		06/26/2002			5.20	839	1.68	33	0.068	380	19060	1140
		06/27/2002			6.00	839	1.68	33	0.068	300	14760	880
		06/28/2002			5.30	839	1.68	33	0.068	340	17080	1020
		06/29/2002			5.50	839	1.68	33	0.068	30	15140	900
		06/30/2002			6.60	839	1.68	33	0.068	320	15740	940
		07/01/2002			7.40	839	1.68	33	0.068	380	18760	1120
		July										
		07/01/2002	Foul water compressor down		7.42	826	1.70	33	0.068	420	21240	1220
		07/02/2002			6.26	826	1.70	33	0.068	360	17920	1040
		07/03/2002			5.88	826	1.70	33	0.068	340	16840	960
		07/04/2002			6.15	826	1.70	33	0.068	340	17600	1020
		07/05/2002			6.97	826	1.70	33	0.068	400	19960	1140
		07/06/2002			6.17	826	1.70	33	0.068	340	17640	1020
		07/07/2002			5.80	826	1.70	33	0.068	320	16580	960

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Tesoro					Volume	HHV	H2S	Mol. Wt	NOx	Nox	SOx	Hydrocarbon
SOURCE NAME & NUMBER		RELEASE DATE & TIME	CAUSE/COMMENTS		(MMSCFD)	(BTU/SCF)	(Mole %)	(lbs/mole)	(lbs/mbtu)	(lbs/day)	(lbs/day)	(lbs/day)
		07/08/2002			6.38	826	1.70	33	0.068	360	18280	1060
		07/09/2002			7.82	826	1.70	33	0.068	440	22400	1280
		07/10/2002	#2 H2 Plant PSA vent to flare		8.60	826	1.70	33	0.068	480	24620	1420
		07/11/2002			7.02	826	1.70	33	0.068	400	20080	1160
		07/12/2002			6.92	826	1.70	33	0.068	380	19800	1140
		07/13/2002			6.98	826	1.70	33	0.068	400	19980	1140
		14-Jul			6.09	826	1.70	33	0.068	340	17440	1000
		07/15/2002			6.39	826	1.70	33	0.068	360	18280	1060
		07/16/2002			6.15	826	1.70	33	0.068	340	17620	1020
		07/17/2002			5.95	826	1.70	33	0.068	340	17020	980
		07/18/2002	#3 Crude furnace tripped off, #3 HDS Stripper was bypassed to fix leak (see note 1)		9.55	826	0.05	33	0.068	440	800	1580
		07/19/2002			7.03	826	1.70	33	0.068	400	20120	1160
		07/20/2002			5.65	826	1.70	33	0.068	320	16180	940
		7/21/2002			4.92	826	1.70	33	0.068	280	14080	820
		07/22/2002			4.53	826	1.70	33	0.068	260	12980	740
		07/23/2002			4.37	826	1.70	33	0.068	240	12520	720
		07/24/2002			5.23	826	1.70	33	0.068	300	14960	860
		07/25/2002			7.27	826	1.70	33	0.068	400	20800	1200
		07/26/2002	Lost lean DEA pump, flared fule gas (see note 2)		12.59	1092	3.50	33	0.068	940	49240	2080
		07/27/2002	Adjusting unit rates after upset		8.80	826	1.70	33	0.068	500	25180	1440
		07/28/2002	#2 H2 Plant shutdown		6.10	826	1.70	33	0.068	340	17480	1000
		07/29/2002	Units are cut back due to H2 shortage		3.97	826	1.70	33	0.068	220	11360	660
		07/30/2002			3.95	826	1.70	33	0.068	220	11320	660
		07/31/2002			3.27	826	1.70	33	0.068	180	9380	540
Based on average for 136 lab samples unless otherwise noted.												
Specific gravity	0.533796											
AF-BTU/CF (gross)	826											

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Tesoro					Volume	HHV	H2S	Mol. Wt	NOx	Nox	SOx	Hydrocarbon
SOURCE NAME & NUMBER		RELEASE DATE & TIME		CAUSE/COMMENTS	(MMSCFD)	(BTU/SCF)	(Mole %)	(lbs/mole)	(lbs/mbtu)	(lbs/day)	(lbs/day)	(lbs/day)
mol %)												
Hydrogen sulfide (mol %)	1.94											
Nitrogen (mol %)	6.77											
Hydrogen (mol %)	55											
Note 1: Based on actual sample pulled for that day.												
Note 2: Based on engineering estimates.												
		August							MW of HC only		SO2 (lbs)	VOC (lbs)
		1			3.30	803	1.51	32	0.068	180	8420	520
		2			7.30	803	1.51	32	0.068	400	18580	1140
		3			7.80	803	1.51	32	0.068	420	19940	1240
		4			6.10	803	1.51	32	0.068	340	15580	960
		5		H2 Plant shutdown 13 hours	16.10	803	1.51	32	0.068	580	19580	1160
		6			6.10	803	1.51	32	0.068	340	15620	960
		7			4.80	803	1.51	32	0.068	340	15520	960
		8			7.20	803	1.51	32	0.068	260	12300	760
		9			5.30	803	1.51	32	0.068	400	18380	1140
		10			5.10	803	1.51	32	0.068	300	13580	840
		11			7.80	803	1.51	32	0.068	280	12960	800
		12			5.40	803	1.51	32	0.068	420	19780	1220
		13			4.80	803	1.51	32	0.068	300	13720	840
		14			6.00	803	1.51	32	0.068	260	12080	740
		15			6.30	803	1.51	32	0.068	320	15260	940
		16			6.40	803	1.51	32	0.068	340	16300	980
		17		Previous 30 days average	6.40	803	1.51	32	0.068	360	16300	1000

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TO REDUCE EMISSIONS FROM FLARES**

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Tesoro					Volume	HHV	H2S	Mol. Wt	NOx	Nox	SOx	Hydrocarbon
SOURCE NAME & NUMBER		RELEASE DATE & TIME		CAUSE/COMMENTS	(MMSCFD)	(BTU/SCF)	(Mole %)	(lbs/mole)	(lbs/mbtu)	(lbs/day)	(lbs/day)	(lbs/day) (lbs/day NMHC @ 99.5%)
		18		We had problems with data collection on July 17-28 and 31	6.40	803	1.51	32	0.068	360	16300	1000
		19			6.40	803	1.51	32	0.068	360	16300	1000
		20			6.40	803	1.51	32	0.068	360	16300	1000
		21			6.40	803	1.51	32	0.068	360	16300	1000
		22			6.40	803	1.51	32	0.068	360	16300	1000
		23			6.40	803	1.51	32	0.068	360	16300	1000
		24			6.40	803	1.51	32	0.068	360	16300	1000
		25			6.40	803	1.51	32	0.068	360	16300	1000
		26			6.40	803	1.51	32	0.068	360	16300	1000
		27			6.40	803	1.51	32	0.068	360	16300	1000
		28			6.40	803	1.51	32	0.068	360	16300	1000
		29			6.20	803	1.51	32	0.068	340	15700	960
		30			6.40	803	1.51	32	0.068	360	16300	1000
		31			6.40	803	1.51	32	0.068	360	16300	1000

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TO REDUCE EMISSIONS FROM FLARES**

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### C. Shell

SOURCE NAME & NUMBER	RELEASE DATE & TIME		Duration (minutes)	CAUSE/COMMENTS	Flow (MMSCF)	Hydrocarbon (lbs NMHC 99.5% eff.)	SO2 (lbs)	NO2 (lbs) (0.003 lb/mmbtu)	NO (lbs) (0.042 lb/mmbtu)
OPCEN S#1772	06/04/2002	0	110	Depressurizing Dimersol reactor for air cooler cleaning	0.0200	4.200	0	0.200	2.000
OPCEN S#1772	06/04/2002	530	610	Depressurizing Dimersol reactor for air cooler cleaning	0.0080	1.700	0	0.060	0.830
OPCEN S#1772	06/04/2002	2030	482	Depressurizing Dimersol reactor for air cooler cleaning	0.6030	118.700	0	4.500	59.070
LOP	06/22/2002	756	5	N/A	0.0150	3.200	48	0.110	1.500
LOP	06/23/2002	1433	6	Cat Reformer compressor problems	0.0130	2.800	42	0.050	0.650
LOP	06/24/2002	555	11	Cat Reformer compressor problems	0.0350	7.400	78	0.150	2.100
LOP	06/24/2002	635	9	Cat Reformer compressor problems	0.0310	6.500	83	0.100	1.450
LOP	06/26/2002	1115	14	Upset on SGP RA column	0.0320	6.700	66	0.130	1.660
LOP	06/27/2002	914	6	N/A	0.0210	4.400	35	0.070	0.870
Flexigas	Jun-02		43200	HCU turnaround, heaters down therefore higher than usual flaring	4590.0000	9713.500	54341	1679.900	23519.200
				Emissions include vent, purge and pilot gas					
	July								
LOP	07/09/2002	1711-1724	13	Failure of diaphram on depressuring valve on HCU 2nd stage	0.2000	43.600	85	0.400	5.400
LOP	7/18-19/2002	1404-0001	596	Isolation of seal pots and k/o for required inspection	1.4000	152.700	1495	0.200	45.200
Opcen	07/25/2002	1525-1800	155	Pinhole leak on vessel required depressuring of LPG in vessel to flare	0.0300	17.600	0	0.200	3.000
Opcen	07/29/2002	0545-0551	6	Unit Startup	0.0003	0.200	0	0.002	0.029
Flexigas	Continuous			Excess gas	1195.0000	2522.300	14147	437.300	6122.900
	August								
LOP	08/02/2002	1021-0100	879	Flare vessel 10yr inspection	2.5000	279.500	3233	5.500	77.200
	08/03/2002	0842-0858	17	CGP RA Col depressure to flare header	0.2000	46.400	333	0.700	9.300
	08/12/2002	1043-2031	588	Flare vessel 10yr inspection	1.6000	179.000	1463	3.900	54.600
	08/14/2002	1149-	4	Compressor down for maintenance	0.0070	1.500	36	0.020	0.300

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>SOURCE NAME &amp; NUMBER</b>	<b>RELEASE DATE &amp; TIME</b>		<b>Duration (minutes)</b>	<b>CAUSE/COMMENTS</b>	<b>Flow (MMSCF)</b>	<b>Hydrocarbon (lbs NMHC 99.5% eff.)</b>	<b>SO2 (lbs)</b>	<b>NO2 (lbs) (0.003 lb/mmbtu)</b>	<b>NO (lbs) (0.042 lb/mmbtu)</b>
		1152							
	08/21/2002	926	22	Dimer feed to SWS 3 via feed surge drum water drain level loss	0.0670	14.100	57	0.210	3.000
OPCEN	08/03/2002	855	4	Excess fuel	0.0010	0.300	0	0.100	0.000
	08/13/2002	1900	1620	Dimersol S/D	0.0200	10.100	0	0.100	1.800
	08/14/2002	1602	3	Excess fuel	0.0048	1.000	0	0.200	0.014
	08/21/2002	745	10	Dimersol S/U	0.0450	26.400	0	0.360	4.700
	08/21/2002	1025	5	Dimersol S/U	0.0001	0.045	0	0.001	0.008
	08/21/2002	1255	15	Dimersol S/U	0.0750	43.600	0	0.590	7.700
	08/21/2002	1500	11	Excess fuel	0.0200	4.200	0	0.840	0.060
	08/22/2002	823	20	Excess fuel	0.0280	5.900	0	0.900	1.190
Flexigas	Continuous			Excess gas	734.3000	1549.900	8693	268.700	3762.400

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
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**D. Valero**

RELEASE DATE & TIME	CAUSE/COMMENTS	Volume	Comb. Eff.	HHV	Mol. Wt.	H2S	H2	N2	NOx	Estimated Flare Emissions, lbs		
		MMSCF	%	BTU/SCF	Ibs/mole	Mole %	Mole %	Mole %	Ibs/mbtu	NOx	SO2	VOC
06/01/2002		0.0	99%	1649	28	1.2	40.0					0
06/02/2002		0.0	99%	1649	28	1.2	40.0					0
06/03/2002	Partial recovery from power failure	4.4	99%	1454	29	0.8	30.5		0.1	432	5845	3292
06/04/2002	Recovering from power failure	5.8	99%	1454	29	1.5	30.5		0.1	554	14052	4221
06/05/2002	Recovering from power failure	2.9	100%	848	26	0.4	12.1		0.1	168	1954	991
06/06/2002	Partial recovery from power failure	5.3	99%	1391	28	1.1	35.6		0.1	497	9655	3847
06/07/2002	Recovering from power failure	11.1	99%	1391	28	1.5	35.6		0.1	1048	27779	8118
06/08/2002	Recovering from power failure	7.3	99.5%	1766	36	1.3	17.5		0.1	874	15892	3405
06/09/2002	Recovering from power failure	3.8	99.5%	1766	36	1.3	17.5		0.1	455	8239	3460
06/10/2002	Recovering from power failure	1.0	99.5%	1199	28	0.4	20.5		0.1	84	691	759
06/11/2002		0.1	99%	818	22	0.4	35.8					59
06/12/2002		0.0	99%	729	18	1.1	47.9					0
06/13/2002		0.0	99%	782	15	1.9	56.9					0
06/14/2002		0.0	99%	951	20	1.1	44.5					0
06/15/2002		0.1	99%	251	10	0.0	68.5					27
06/16/2002		0.1	99%	212	13	0.0	59.7					34
06/17/2002		0.2	99%	977	18	1.8	52.9					97
06/18/2002		0.2	99%	779	16	1.9	55.8					84
06/19/2002		0.1	99%	1297	24	1.0	34.8					63
06/20/2002		0.1	99%	989	19	1.2	52.9					50
06/21/2002		0.1	99%	863	18	1.0	46.2					47
06/22/2002		0.3	99%	939	19	1.4	45.1					150
06/23/2002	DHFU N2 cooldown. Shut down flare gas compressor.	7.4	99.5%	958	29	0.5	20.6		0.1	481	6207	1482
06/24/2002	DHFU N2 cooldown. Shut down flare gas compressor.	3.7	99.5%	1885	38	1.7	18.1		0.1	479	10681	1556

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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		Volume	Comb. Eff.	HHV	Mol. Wt.	H2S	H2	N2	NOx	Estimated Flare Emissions, lbs		
RELEASE DATE & TIME	CAUSE/COMMENTS	MMSCF	%	BTU/SCF	Ibs/mole	Mole %	Mole %	Mole %	Ibs/mbtu	NOx	SO2	VOC
06/25/2002		1.0	99%	1196	21	0.7	31.5					549
06/26/2002		0.5	99%	889	18	0.9	38.7					232
06/27/2002		0.3	99%	1040	19	0.4	38.8					148
06/28/2002		0.4	99%	950	17	1.2	39.4					184
06/29/2002		0.1	99%	948	16	1.0	45.3					42
06/30/2002		0.7	99%	210	23	0.0	23.4					425
July												
1	Cat Feed Hydrofiner (CFHU) startup	1.5		1032	21	0.7	31.9	18.6	0	106	1777	425
2	CFHU startup	1.7		797	15	0.4	45.3	12.9	0	90	1120	336
3		0.6		730	15	0.6	49.4	14.4				
4		0.7		1273	24	0.6	32.3	12.0				
5		0.1		928	17	1.7	56.9	11.8				
6		0.1		759	16	0.9	56.7	14.4				
7		0.0		885	16	1.2	57.4	9.3				
8		0.6		915	17	1.2	53.5	11.7				
9		0.1		1110	20	1.5	51.9	10.2				
10		0.1		1033	18	1.3	59.2	6.8				
11		0.1		1064	17	1.4	59.9	6.1				
12		0.7		1137	19	1.9	53.7	5.1				
13	CFHU unsch. Compressor shutdown	1.0		1137	19	1.9	53.7	5.1	0	80	3302	261
14		0.2		1137	19	1.9	53.7	5.1				
15		0.2		1108	20	1.3	52.3	7.3				
16		0.3		1108	20	1.3	52.3	7.3				
17		0.2		1824	38	3.0	0.0	20.4				
18		0.2		827	16	1.1	56.6	12.9				
19		1.2		1087	20	1.3	51.5	9.1	0	90	2654	320
20		0.8		1136	25	1.0	36.1	21.9				
21		0.7		910	23	0.8	39.3	29.9				
22		0.6		1134	23	1.2	47.7	14.1				

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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		Volume	Comb. Eff.	HHV	Mol. Wt.	H2S	H2	N2	NOx	Estimated Flare Emissions, lbs		
RELEASE DATE & TIME	CAUSE/COMMENTS	MMSCF	%	BTU/SCF	Ibs/mole	Mole %	Mole %	Mole %	Ibs/mbtu	NOx	SO2	VOC
23	Hot weather fuel gas containment	2.0		1268	23	0.5	48.9	6.1	0	168	1641	587
24		0.8		1041	26	0.7	34.6	29.1				
25		1.0		1157	21	1.4	51.9	8.7				
26	Hydrocracker startup	2.0		1478	27	1.5	42.5	8.3	0	199	4979	699
27		0.7		1663	29	0.8	31.4	5.2				
28		0.7		1663	29	0.8	31.4	5.2				
29		0.4		986	27	0.6	26.9	28.5				
30		0.1		1417	25	1.1	40.9	8.0				
31		0.2		1321	27	1.3	33.6	16.2				
August												
1		0.4		1220	23	0.2	44.6	10.1				
2		1.0		1482	26	0.1	42.9	2.2				
3		0.1		1604	28	1.2	40.1	2.4				
4		0.6		1282	23	0.6	45.6	7.4				
5		0.5		1219	22	1.3	46.7	8.3				
6		0.4		1443	26	0.3	41.5	5.1				
7		0.1		1136	23	0.9	35.9	13.0				
8		0.4		1049	26	0.6	24.9	21.8				
9		1.0		1120	21	1.4	45.4	10.3				
10		0.5		1204	23	1.1	44.7	9.7				
11		0.5		1219	23	1.2	43.5	10.2				
12		0.2		1187	22	1.4	46.7	8.6				
13		0.4		1352	24	1.1	40.4	6.8				
14		0.2		1338	24	1.3	39.7	7.3				
15		0.4		1446	26	1.2	35.5	8.6				
16		0.2		1077	20	1.6	48.2	8.4				
17	Build-up of non-condensibles in ALKY refrigeration system	1.2		1274	24	1.0	41.6	8.8		104	2187	376
18		0.5		1274	24	1.0	41.6	8.8				
19		0.0		1274	24	1.0	41.6	8.8				

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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		Volume	Comb. Eff.	HHV	Mol. Wt.	H2S	H2	N2	NOx	Estimated Flare Emissions, lbs		
RELEASE DATE & TIME	CAUSE/COMMENTS	MMSCF	%	BTU/SCF	Ibs/mole	Mole %	Mole %	Mole %	Ibs/mbtu	NOx	SO2	VOC
20		0.2		1274	24	1.0	41.6	8.8				
21		0.1		1274	24	1.0	41.6	8.8				
22		0.1		1274	24	1.0	41.6	8.8				
23		0.0		1274	24	1.0	41.6	8.8				
24		0.1		1274	24	1.0	41.6	8.8				
25		0.1		1274	24	1.0	41.6	8.8				
26		0.1		1274	24	1.0	41.6	8.8				
27		0.0		1274	24	1.0	41.6	8.8				
28		0.0		1274	24	1.0	41.6	8.8				
29		0.2		1274	24	1.0	41.6	8.8				
30		0.0		1274	24	1.0	41.6	8.8				
31		0.0		1274	24	1.0	41.6	8.8				

Note: Composition based on GC analyses. Data in bold are estimated values.

## E. Phillips 66

Phillips 66		VOLUME	HYDROCARBON	NOX	SOx	VOC
RELEASE DATE	CAUSE/COMMENTS	(MMSCFD)	TO FLARE (LBS)	(@ .068/10^6 mmbtu)	@ TRS	(as CH4 @99.5% )
06/10/2002	U240 S/D	0.90		8.0000	165.000	20.670
06/11/2002	U240 S/U	3.06		185.0000	3810.000	476.330
06/12/2002		14.12		1087.0000	22428.000	2803.330
06/13/2002	UK complete	13.90		1069.0000	22069.000	2758.670
06/18/2002	U228 S/D	1.32		42.0000	876.000	109.330
06/19/2002		0.76				
06/20/2002						
07/01/2002		0.87	36,818.00	0.0356	0.736	184.000
07/02/2002	U240 SD	3.23	136,477.00	0.1319	2.730	682.670
07/03/2002	Unicracker SU	1.70	71,747.00	0.0693	1.435	358.670
04-Jul	Circulating compressor due to high flow/low gravity	1.51	63,862.00	0.0617	1.277	319.330
05-Jul		0.74	31,102.00	0.0301	0.622	155.330
06-Jul		0.83	35,071.00	0.0339	0.701	175.330
07-Jul		0.80	33,744.00	0.0326	0.675	168.670
08-Jul		0.83	34,916.00	0.0337	0.698	174.670
09-Jul		0.84	25,299.00	0.0341	0.706	176.670
10-Jul	Steam system failure					
11-Jul	Steam system failure					
12-Jul	U 240 hydrogen plant SU	1.12	47,357.00	0.0458	0.947	236.670
13-Jul	SU	1.19	50,377.00	0.0487	1.008	252.000
14-Jul		1.47	61,854.00	0.0598	1.237	309.330
15-Jul		0.97	40,941.00	0.0396	0.819	204.670
16-Jul	SU, fire on exchanger	1.38	58,333.00	0.0564	1.167	291.330
17-Jul	SU, fire on exchanger	1.26	52,243.00	0.0515	1.065	266.000
18-Jul		1.14	48,001.00	0.0464	0.960	240.000
19-Jul		1.13	47,498.00	0.0459	0.950	237.330

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Phillips 66		VOLUME	HYDROCARBON	NOX	SOx	VOC
RELEASE DATE	CAUSE/COMMENTS	(MMSCFD)	TO FLARE (LBS)	(@ .068/10^6 mmbtu)	@ TRS	(as CH4 @99.5%)
20-Jul		1.00	42,010.00	0.0406	0.840	210.000
21-Jul		1.02	43,193.00	0.0417	0.864	216.000
22-Jul		1.02	43,007.00	0.0416	0.860	215.330
23-Jul		0.96	40,437.00	0.0391	0.809	202.000
24-Jul	U288 SU	0.96	40,597.00	0.0392	0.812	202.670
25-Jul		1.01	42,841.00	0.0414	0.857	214.000
26-Jul		1.13	47,585.00	0.0460	0.952	238.000
27-Jul		0.99	41,817.00	0.0404	0.836	209.330
28-Jul	Increased purge due to high winds	1.03	43,317.00	0.0419	0.866	216.670
29-Jul		1.03	43,587.00	0.0421	0.872	218.000
30-Jul	Increased purge due to low tip temperature	1.03	43,343.00	0.0419	0.867	216.670
31-Jul		1.04	43,949.00	0.0425	0.879	220.000
01-Aug	H2 recycle compressor SD, MP-30SD	4.64	195,735.00	0.1892	3.950	978.670
02-Aug		0.99	41,771.00	0.0404	0.835	208.670
03-Aug		0.97	40,816.00	0.0394	0.816	204.000
04-Aug		1.01	42,484.00	0.0411	0.850	212.670
05-Aug		1.06	44,540.00	0.0430	0.891	222.670
06-Aug		1.18	50,001.00	0.0483	1.000	250.000
07-Aug		1.23	51,808.00	0.0501	1.036	259.330
08-Aug		1.65	69,866.00	0.0675	1.397	349.330
09-Aug		1.49	62,823.00	0.0607	1.256	314.000
10-Aug		1.50	63,410.00	0.0613	1.268	317.330
11-Aug		1.40	59,304.00	0.0573	1.186	296.670
12-Aug	GB-301 air compressor SD, U110 SD	3.02	127,606.00	0.1233	2.552	638.000
13-Aug		1.26	53,263.00	0.0515	1.065	266.000
14-Aug		1.36	57,252.00	0.0553	1.145	286.000
15-Aug		1.39	58,678.00	0.0567	1.174	293.330
16-Aug		1.16	48,881.00	0.0472	0.978	244.670
17-Aug		1.04	43,987.00	0.0425	0.880	220.000

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Phillips 66		VOLUME	HYDROCARBON	NOX	SOx	VOC
RELEASE DATE	CAUSE/COMMENTS	(MMSCFD)	TO FLARE (LBS) (@ .068/10^6 mmbtu)	@ TRS	(as CH4 @99.5%)	
18-Aug		1.00	42,191.00	0.0408	0.844	210.670
19-Aug		1.05	44,314.00	0.0428	0.886	221.330
20-Aug		0.97	40,842.00	0.0395	0.817	204.000
21-Aug		1.02	42,898.00	0.0415	0.858	214.670
22-Aug		0.99	41,840.00	0.0404	0.837	209.330
23-Aug		0.95	39,991.00	0.0386	0.800	200.000
24-Aug		0.95	39,898.00	0.0386	0.798	199.330
25-Aug		0.93	39,431.00	0.0381	0.789	197.330
26-Aug		0.93	39,276.00	0.0380	0.786	196.670
27-Aug	Lost feed water pumps, H2 plant SD	2.14	90,303.00	0.0873	1.806	451.330
28-Aug		1.59	67,072.00	0.0648	1.341	335.330
29-Aug		1.11	46,910.00	0.0453	0.938	243.670
30-Aug		1.07	45,077.00	0.0436	0.902	225.330
31-Aug		1.03	43,273.00	0.0418	0.865	216.670

## **Appendix 2: Historical Reported Data with Emission Estimate**

### **A. Chevron**

Chevron Reported Data													District's VOC Estimate
(Purge and pilot gas not included)													
	Flare	Flare		Flow Rate to Flare	Duration	Released Volume	H2S	Release amounts (lbs.)					
Date	Name	Number	Cause	(MMSCFD)	(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)	
5/1/01	RLOP	S6039	RLOP flare off of FGR	1.3	3.58	0.19	1.33	10	427	0.2	EPI	338	
5/5/01	SISO	S6012	S. Iso off FGR due to high pressure (heat of the day)	1.18	4.25	0.21	0	11	0	0.2	EPI	364	
5/7/01	D&R	S6010	LSFO flaring due to heat of the day	0.25	1.22	0.01	0	1	0	0	EPI	22	
5/7/01	D&R	S6010	LSFO flaring due to heat of the day	0.25	3.58	0.04	0	2	0	0	EPI	65	
5/7/01	D&R	S6010	LSFO flaring due to heat of the day	2.5	0.53	0.06	0.4	3	37	0	EPI	97	
5/8/01	D&R	S6010	Minor flaring @ LSFO flare	0.25	0.75	0.01	0	0	0	0	EPI	14	
5/11/01	RLOP	S6039	K-1060 mechanical failure (#3 cylinder down); K-1070 also down 5/11/01 to 5/12/01	1.5	14.38	0.90	4	47	5951	0.7	EPI	1565	
5/11/01	NISO	S6013	K-1060 mechanical failure (#3 cylinder down); K-1070 also down 5/11/01 to 5/12/01	1.2	24.00	1.20	3	105	9930	1.6	EPI	2090	
5/11/01	FCC	S6016	K-1060 mechanical failure (#3 cylinder down); K-1070 also down 5/11/01 to 5/12/01	2	14.55	1.21	0.7	64	1405	1	EPI	2111	
5/11/01	SISO	S6012	K-1060 mechanical failure (#3 cylinder down); K-1070 also down 5/11/01 to 5/12/01	2	24.00	2.00	0.03	63	60	1	EPI	3483	
5/12/01	NISO	S6013	K-1060 mechanical failure 5/12/01 to 5/13/01	2	3.82	0.32	3	17	1579	0.3	EPI	554	
5/12/01	SISO	S6012	K-1060 mechanical failure 5/12/01 to 5/13/01	1.2	24.00	1.20	1	63	1986	1	EPI	2090	
5/12/01	FCC	S6016	K-1060 mechanical failure 5/12/01 to 5/13/01	2	20.18	1.68	0.8	89	2227	1.4	EPI	2929	
5/13/01	NISO	S6013	K-1060 mechanical failure 5/13/01 to 5/14/01	1.5	4.42	0.28	0.5	15	228	0.2	EPI	481	
5/13/01	SISO	S6012	K-1060 mechanical failure 5/13/01 to 5/14/01	1.2	10.42	0.52	0.1	27	86	0.4	EPI	907	
5/13/01	FCC	S6016	K-1060 mechanical failure 5/13/01 to 5/14/01	2.5	19.58	2.04	0.7	108	2363	1.7	EPI	3552	
5/14/01	SISO	S6012	K-1060 mechanical failure 5/14/01 to 5/15/01	1.2	4.00	0.20	0.1	11	33	0.2	EPI	348	
5/14/01	FCC	S6016	K-1060 mechanical failure 5/14/01 to 5/15/01	2.5	4.00	0.42	0.7	22	483	0.3	EPI	726	
5/14/01	NISO	S6013	K-1060 mechanical failure 5/14/01 to 5/15/01	1.5	23.22	1.45	0.5	77	1201	1.2	EPI	2527	
5/15/01	RLOP	S6039	K-1060 Maintenance-CRR	2.5	0.70	0.07	2	4	241	0.1	CRR	122	

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Chevron													District's VOC Estimate
(Purge and pilot gas not included) Chevron Reported Data													
	Flare	Flare	Flow Rate to Flare			Duration	Released Volume	H2S	Release amounts (lbs.)				
Date	Name	Number	Cause	(MMSCFD)		(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)
5/15/01	siso	S6012	K-1060 Maintenance-CRR	1.2		24.00	1.20	0.1	58	199	0.9	CRR	2090
5/15/01	FCC	S6016	K-1060 Maintenance-CRR	1.9		24.00	1.90	1.05	174	3302	2.7	CRR	3309
5/16/01	NISO	S6013	K-1060 Maintenance-CRR	1.5		0.15	0.01	0.5	1	8	0	CRR	17
5/16/01	RLOP	S6039	K-1060 Maintenance-CRR	1.5		0.15	0.01	4	1	62	0	CRR	17
5/16/01	siso	S6012	K-1060 Maintenance-CRR	1.2		24.00	1.20	0	63	0	1	CRR	2090
5/16/01	FCC	S6016	K-1060 Maintenance-CRR	1.9		24.00	1.90	0.1	159	315	2.5	CRR	3309
5/17/01	siso	S6012	K-1060 Maintenance-CRR	1.2		9.50	0.48	0.14	25	110	0.4	CRR	836
5/17/01	FCC	S6016	K-1060 Maintenance-CRR	1.9		9.50	0.75	2.2	63	2738	1	CRR	1306
5/17/01	NISO	S6013	K-1060 Maintenance-CRR	1.5		14.50	0.91	2.2	48	3300	0.7	CRR	1585
5/18/01	NISO	S6013	K-1060 Maintenance-CRR	1.5		0.08	0.01	2.2	0	19	0	CRR	17
5/18/01	RLOP	S6039	K-1060 Maintenance-CRR	1.5		0.08	0.01	4	0	35	0	CRR	17
5/18/01	siso	S6012	K-1060 Maintenance-CRR	1.2		24.00	1.20	0.14	63	278	1	CRR	2090
5/18/01	FCC	S6016	K-1060 Maintenance-CRR	1.9		24.00	1.90	0	159	0	2.5	CRR	3309
5/19/01	siso	S6012	K-1060 Maintenance-CRR	1.2		24.00	1.20	0.3	63	596	1	CRR	2090
5/19/01	FCC	S6016	K-1060 Maintenance-CRR	1.9		24.00	1.90	0.26	159	818	2.5	CRR	3309
5/20/01	siso	S6012	K-1060 Maintenance-CRR	1.2		24.00	1.20	0.24	63	477	1	CRR	2090
5/20/01	FCC	S6016	K-1060 Maintenance-CRR	1.51		24.00	1.51	0	126	0	2	CRR	2630
5/21/01	siso	S6012	K-1060 Maintenance-CRR	1.2		24.00	1.20	0.23	63	449	1	CRR	2090
5/21/01	FCC	S6016	K-1060 Maintenance-CRR	1.68		24.00	1.68	0	122	0	1.9	CRR	2926
5/22/01	siso	S6012	K-1060 Maintenance-CRR	1.2		24.00	1.20	0.13	63	258	1	CRR	2090
5/22/01	FCC	S6016	K-1060 Maintenance-CRR	1.64		24.00	1.64	0.05	140	139	2.2	CRR	2856
5/23/01	siso	S6012	K-1060 Maintenance-CRR	1.2		24.00	1.20	0.12	63	238	1	CRR	2090
5/23/01	FCC	S6016	K-1060 Maintenance-CRR	1.66		24.00	1.66	0.06	139	165	2.1	CRR	2891
5/24/01	siso	S6012	K-1060 Maintenance-CRR	1.2		24.00	1.20	0.2	39	397	0.6	CRR	2090
5/24/01	FCC	S6016	K-1060 Maintenance-CRR	1.66		24.00	1.66	0	139	0	2.2	CRR	2891

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Chevron													District's VOC Estimate	
(Purge and pilot gas not included) Chevron Reported Data														
	Flare	Flare	Flow Rate to Flare			Duration	Released Volume	H2S	Release amounts (lbs.)					
Date	Name	Number	Cause	(MMSCFD)			(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)
5/25/01	NISO	S6013	K-1060 Maintenance-CRR	1.7		0.10	0.01	3	0	35	0	CRR	17	
5/25/01	siso	S6012	K-1060 Maintenance-CRR	1.2		24.00	1.20	0.2	53	397	0.8	CRR	2090	
5/25/01	FCC	S6016	K-1060 Maintenance-CRR	1.66		24.00	1.66	0	141	0	2.2	CRR	2891	
5/26/01	siso	S6012	K-1060 Maintenance-CRR	0.65		2.08	0.06	4.7	2	439	0	CRR	104	
5/26/01	NISO	S6013	K-1060 Maintenance-CRR	1.03		1.67	0.07	8	2	947	0	CRR	122	
5/26/01	FCC	S6016	K-1060 Maintenance-CRR	1.2		24.00	1.20	0	122	0	1.9	CRR	2090	
5/26/01	siso	S6012	K-1060 Maintenance-CRR	1.66		24.00	1.66	0.2	55	397	0.9	CRR	2891	
5/29/01	FCC	S6016	K-1060 Maintenance-CRR	1.7		12.00	0.85	0	71	0	1.1	CRR	1480	
5/30/01	SISO	S6012	SDA S/D; T-3038 overheat; South Isomax flare off FGR	1.2		9.50	0.48	0.2	25	157	0.4	EPI	827	
5/31/01	D&R	S6010	K-3950 compressor shutdown due to bad order low suction pressure device	1.75		1.67	0.12	0.05	6	10	0.1	EPI	212	
5/31/01	FCC	S6016	SDA S/D; T-3038 venting; heat of the day flaring; FCC off FGR.	1.5		6.17	0.39	0	34	0	0.5	EPI	671	
5/31/01	siso	S6012	K-1060 Maintenance-CRR	1.6		10.33	0.69	0.2	36	228	0.6	CRR	1202	
5/31/01	FCC	S6016	K-1060 Maintenance-CRR	1.9		10.33	0.82	0	71	0	1.1	CRR	1428	
6/1/01	FCC	S6016	FCC flare activity due to SDA startup	1.3		0.17	0.01	0	1	0	0	EPI	16	
6/8/01	FCC	S6016	FCC Flaring due to V-1441 safety lifting	4.02		0.17	0.03	0	2	0	0	EPI	49	
6/11/01	D&R	S6010	K-3950 flare gas compressor shutdown for no apparent reason.	1.7		0.83	0.06	0.34	3	33	0	EPI	103	
6/13/01	D&R	S6010	K-1171A S/D; hot valves	0.85		11.97	0.42	0.11	11	77	0.2	EPI	738	
6/27/01	D&R	S6010	DHT Reactor HIC-1600 failed open to flare (loose wire)	11		0.10	0.05	0	2	0	0.02	EPI	80	
7/3/01	D&R	S6010	LSFO Flaring	1.5		0.12	0.01	0.05	1	3	0	EPI	13	
7/3/01	RLOP	S6039	Flare activity on RLOP flare due to over pressuring of Flare Gas recovery during heat of day	0.8		7.50	0.25	1.39	13	575	0.2	EPI	435	
7/12/01	SISO	S6012	K-1060 has loose cylinder liner; S/D to prevent further damage.	1.66		24.00	1.66	0.26	88	701	1.4	EPI	2891	
7/12/01	FCC	S6016	K-1060 has loose cylinder liner; S/D to prevent further damage.	1.94		24.00	1.94	0	102	0	1.6	EPI	3378	
7/13/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.48		24.00	1.48	0.4	78	980	1.2	CRR	2577	

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Chevron													District's VOC Estimate
(Purge and pilot gas not included) Chevron Reported Data													
	Flare	Flare	Flow Rate to Flare			Duration	Released Volume	H2S	Release amounts (lbs.)				
Date	Name	Number	Cause	(MMSCFD)		(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)
7/13/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	2.12		24.00	2.12	0	112	0	0	CRR	3692
7/14/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.48		7.42	0.46	0.4	24	303	0.4	CRR	801
7/14/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	2.12		7.42	0.66	0	35	0	0.5	CRR	1149
7/15/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.31		24.00	1.31	0.2	69	433	1.1	CRR	2281
7/15/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1.66		24.00	1.66	0	88	0	1.4	CRR	2891
7/16/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.31		24.00	1.31	0.2	69	434	1.1	CRR	2281
7/16/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1.65		24.00	1.65	0.08	87	219	1.3	CRR	2873
7/17/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.24		24.00	1.24	0.2	65	411	1	CRR	2159
7/17/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1.73		24.00	1.73	0.07	91	200	1.4	CRR	3013
7/18/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.27		17.50	0.93	0.15	49	230	0.8	CRR	1620
7/18/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1.7		17.50	1.24	0.08	65	154	1	CRR	2159
7/26/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.59		12.50	0.83	0.18	44	247	0.7	CRR	1445
7/26/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1.88		12.50	0.98	0.07	52	113	0.8	CRR	1707
7/27/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.59		1.67	0.11	0.18	6	33	0.1	CRR	192
7/27/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1.88		1.67	0.13	0.07	7	15	0.1	CRR	226
7/30/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1.52		24.00	1.52	0.04	80	101	1.2	CRR	2647
7/30/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.61		24.00	1.61	0.2	85	533	1.3	CRR	2804
7/31/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1.52		24.00	1.52	0	80	0	1.2	CRR	2647
7/31/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.61		24.00	1.61	0.1	85	267	1.3	CRR	2804
8/1/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1.52		24.00	1.52	0	80	0	1.2	CRR	2647
8/1/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.61		24.00	1.61	0.2	85	533	1.3	CRR	2804
8/2/01	SISO	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.32		21.50	1.18	0.2	62	391	1	CRR	2055
8/2/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	2.2		21.50	1.97	0	104	0	1.6	CRR	3431
8/12/01	FCC	S6016	FCC flare Activity (caused by PSV lifting)	0.81		0.05	0.00	0.06	0	0	0	EPI	3
8/20/01	NISO	S6013	North Yard Flare Gas Recovery Maintenance - CRR	0.53		1.17	0.03	1.5	1	64	0	CRR	52

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Chevron													District's VOC Estimate
(Purge and pilot gas not included)													
	Flare	Flare		Flow Rate to Flare	Duration	Released Volume	H2S	Chevron Reported Data					
Date	Name	Number	Cause	(MMSCFD)	(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)	75% HC 44 MW 98% eff
8/20/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.96	16.67	0.67	0	52	0	0.8	CRR	1167	
8/20/01	SISO	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.97	24.00	1.97	0.2	104	651	1.6	CRR	3431	
8/21/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.96	24.00	0.96	0	71	0	1.1	CRR	1672	
8/21/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.97	24.00	1.97	0.2	104	651	1.6	CRR	3431	
8/22/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.96	24.00	0.96	0	36	0	0.6	CRR	1672	
8/22/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.97	24.00	1.97	0.2	104	651	1.6	CRR	3431	
8/23/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.96	24.00	0.96	0	81	0	1.3	CRR	1672	
8/23/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.97	24.00	1.97	0.2	104	651	1.6	CRR	3431	
8/24/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.96	24.00	0.96	0	73	0	1.1	CRR	1672	
8/24/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.97	24.00	1.97	0.2	104	651	1.6	CRR	3431	
8/25/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.96	3.33	0.13	0	10	0	0.2	CRR	226	
8/25/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.97	3.33	0.27	0.2	14	91	0.2	CRR	470	
8/30/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor	4.5	2.50	0.47	9	25	6982	0.4	EPI	816	
8/30/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor	7.62	2.00	0.64	0.26	49	275	0.8	EPI	1106	
8/30/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor	2.8	5.83	0.68	2.28	29	2570	0.4	EPI	1185	
8/31/01	FCC	S6016	Shutdown work on Hydrogen Recycle Compressor-CRR	0.3	3.50	0.40	0	4	0	0.1	CRR	697	
9/2/01	FCC	S6016	FCC flare smoked due to excessive flow; pressure on the FCC flare increased 32 inches +.	0.85	0.02	0.00	0	0	0	0	EPI	1	
9/2/01	FCC	S6016	Shutdown work on Hydrogen Recycle Compressor-CRR	0.85	0.17	0.01	0	1	0	0	CRR	17	
9/3/01	SISO	S6012	Flare Gas Recovery upset from excess liquid. Light flaring. Pulling 1 flare off at a time to I.D. source.	1.4	0.30	0.02	1.5	1	41	0	EPI	30	
9/3/01	NISO	S6013	Flare Gas Recovery upset from excess liquid. Light flaring. Pulling 1 flare off at a time to I.D. source.	2.4	0.22	0.02	5	1	179	0	EPI	38	
9/3/01	FCC	S6016	Flare Gas Recovery upset from excess liquid. Light flaring. Pulling 1 flare off at a time to I.D. source.	3.6	0.43	0.07	0	6	0	0.1	EPI	113	
9/4/01	SISO	S6012	Flare activity due to R-410 head leak, which required R-410/-411 depressuring.	1.5	2.00	0.13	0.4	7	83	0.1	EPI	218	
9/4/01	FCC	S6016	Flare activity due to R-410 head leak, which required R-410/-411 depressuring.	1.6	2.67	0.18	0	9	0	0.1	EPI	310	

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Chevron													District's VOC Estimate	
(Purge and pilot gas not included)														
	Flare	Flare	Flow Rate to Flare			Duration	Released Volume	H2S	Release amounts (lbs.)					
Date	Name	Number	Cause	(MMSCFD)		(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)	
9/9/01	FCC	S6016	Shutdown work on Hydrogen Recycle Compressor-CRR	0.36		1.10	0.02	0	1	0	0.1	CRR	35	
9/10/01	FCC	S6016	Shutdown work on Hydrogen Recycle Compressor-CRR	0.45		0.08	0.00	0	0	0	0	CRR	0	
9/10/01	FCC	S6016	Shutdown work on Hydrogen Recycle Compressor-CRR	0.1		1.40	0.01	0	0	0	0	CRR	17	
9/11/01	NISO	S6013	K-500 compressor shutdown due to high vibration, causing TKN to depressure the unit for shutdown.	0.75		1.00	0.03	5.4	2	279	0.02	EPI	54	
9/11/01	NISO	S6013	K-500 compressor shutdown due to high vibration, causing TKN to depressure the unit for shutdown.	3.03		1.00	0.13	3	4	628	0.1	EPI	220	
9/11/01	NISO	S6013	K-500 compressor shutdown due to high vibration, causing TKN to depressure the unit for shutdown.	9.16		0.50	0.19	3	6	948	0.1	EPI	332	
9/11/01	NISO	S6013	K-500 compressor shutdown due to high vibration, causing TKN to depressure the unit for shutdown.	0.75		7.00	0.22	5.4	11	1955	0.17	EPI	381	
9/11/01	NISO	S6013	K-500 compressor shutdown due to high vibration, causing TKN to depressure the unit for shutdown.	1.68		14.00	0.98	2	30	3244	0.5	EPI	1707	
9/12/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	0.75		1.72	0.05	5.4	3	479	0.04	CRR	87	
9/12/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	0.75		3.50	0.11	7	5	1267	0.08	CRR	192	
9/12/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	0.75		15.52	0.48	5.3	22	4249	0.3	CRR	836	
9/12/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	1.99		6.50	0.54	1.5	20	1338	0.31	CRR	940	
9/13/01	D&R	S6010	#4 Rheniformer Scheduled S/D for Regeneration / Rx Dump & Screen	0.4		0.17	0.00	0.05	0	0	0	EPI	5	
9/13/01	D&R	S6010	#4 Rheniformer Scheduled S/D for Regeneration / Rx Dump & Screen	0.9		0.17	0.01	0.05	0	1	0	EPI	11	
9/13/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	0.75		2.52	0.08	7.4	5	963	0.07	CRR	139	
9/13/01	Niso	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	0.75		5.00	0.16	7	9	1810	0.14	CRR	279	
9/14/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	1.7		2.07	0.15	7.2	8	1744	0.13	CRR	261	
9/14/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	1		8.10	0.34	7.2	19	4022	0.3	CRR	592	
9/16/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.7		24.00	1.70	0.2	44	563	0.7	CRR	2960	
9/16/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	2.5		24.00	2.50	0	244	0	3.8	CRR	4354	
9/17/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.7		24.00	1.70	0.3	56	844	0.9	CRR	2960	
9/17/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	2.5		24.00	2.50	0.07	219	286	3.4	CRR	4354	

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
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Chevron													District's VOC Estimate
(Purge and pilot gas not included)													
	Flare	Flare		Flow Rate to Flare	Duration	Released Volume	H2S	Chevron Reported Data					
Date	Name	Number	Cause	(MMSCFD)	(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)	75% HC 44 MW 98% eff
9/19/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.4	10.50	0.18	0	17	0	0.3	CRR	313	
9/19/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.7	24.00	1.70	0.26	63	720	1	CRR	2960	
9/20/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.4	8.33	0.14	0.07	15	15	0.2	CRR	244	
9/20/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	0.96	5.50	0.22	10.5	15	3823	0.2	CRR	383	
9/20/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.7	24.00	1.70	0.22	55	619	0.8	CRR	2960	
9/21/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.5	2.07	0.04	0.28	8	39	0.1	CRR	70	
9/21/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.7	0.58	0.04	0.16	1	11	0	CRR	70	
9/21/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	0.96	3.00	0.12	7	6	1390	0.1	CRR	209	
9/21/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	0.96	8.50	0.34	1.9	5	1069	0.1	CRR	592	
9/21/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	0.96	11.50	0.46	7	24	5329	0.4	CRR	801	
9/21/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	0.96	12.50	0.50	2.8	17	2317	0.3	CRR	871	
9/22/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.1	2.83	0.01	0.23	2	6	0	CRR	17	
9/23/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.4	1.50	0.03	0.13	3	5	0	CRR	52	
9/23/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	1	24.00	1.00	3.4	34	5627	0.5	CRR	1741	
9/24/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	0.5	5.00	0.01	7.5	15	3879	0.2	CRR	17	
9/24/01	D&R	S6010	PenHex Plt S/D; Refinery experienced electrical storm; flare activity due to S/D	12	0.13	0.07	0	3	0	0.1	EPI	116	
9/24/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.3	20.00	0.25	0	26	0	0.4	CRR	435	
9/24/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.4	24.00	0.40	0.22	14	137	0.2	CRR	697	
9/25/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.3	7.50	0.09	0.1	8	13	0.1	CRR	157	
9/25/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.5	24.00	0.50	0.22	18	165	0.3	CRR	871	
9/26/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.3	7.50	0.09	0.1	8	13	0.1	CRR	157	
9/26/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.4	24.00	0.40	0.2	14	126	0.2	CRR	697	
9/27/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.26	24.00	0.26	0	30	0	0.5	CRR	453	
9/27/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.38	24.00	0.38	0.2	13	126	0.2	CRR	662	
9/28/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.38	24.00	0.38	0.2	13	126	0.2	CRR	662	

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Chevron													District's VOC Estimate
(Purge and pilot gas not included) Chevron Reported Data													
	Flare	Flare		Flow Rate to Flare	Duration	Released Volume	H2S	Release amounts (lbs.)					
Date	Name	Number	Cause	(MMSCFD)	(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)	
9/28/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.68	24.00	0.68	0.08	70	88	1.1	CRR	1184	75% HC 44 MW 98% eff
9/28/01	D&R	S6010	DHT startup	4.6	17.67	3.39	0.07	78	384	1.2	EPI	5897	
9/29/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.38	24.00	0.38	0.2	13	126	0.2	CRR	662	
9/29/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.77	24.00	0.77	0	78	0	1.2	CRR	1341	
9/30/01	FCC	S6016	Possible lifting of FCC C-160 safety due to heat of the day	1.4	0.12	0.01	0	1	0	0	EPI	12	
9/30/01	D&R	S6010	Flare activity from LSFO flare	1.1	5.00	0.23	0.28	8	107	0.1	EPI	399	
9/30/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.38	24.00	0.38	0.2	13	126	0.2	CRR	662	
9/30/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.72	24.00	0.72	0	81	0	1.3	CRR	1254	
10/1/01	RLOP	S6039	North Yard Flare Gas Recovery Maintenance - CRR	0.1	3.00	0.01	6	0	124	0	CRR	17	
10/1/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.38	24.00	0.38	0.2	13	126	0.2	CRR	662	
10/1/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.72	24.00	0.72	0.39	67	465	1	CRR	1254	
10/2/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.4	24.00	0.40	0.2	14	132	0.2	CRR	697	
10/2/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.94	24.00	0.94	0.12	90	187	1.4	CRR	1637	
10/3/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.5	24.00	0.50	0.2	43	166	0.7	CRR	871	
10/3/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1.1	24.00	1.10	0.05	94	93	1.5	CRR	1916	
10/4/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.6	6.50	0.16	0.2	14	54	0.2	CRR	279	
10/4/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1.1	6.50	0.30	0.16	27	79	0.4	CRR	522	
10/9/01	NISO	S6013	Shutdown work on Hydrogen Recycle Compressor-CRR	0.75	0.13	0.00	0.16	0	1	0.01	CRR	0	
10/10/01	FCC	S6016	Alky V1441 PRD lifted	1.1	0.08	0.00	0.16	0	1	0	EPI	7	
10/10/01	FCC	S6016	Shutdown work on Hydrogen Recycle Compressor-CRR	1	0.23	0.01	0.16	1	3	0.01	CRR	17	
10/10/01	FCC	S6016	Shutdown work on Hydrogen Recycle Compressor-CRR	0.75	0.42	0.01	0.16	1	3	0.01	CRR	17	
10/10/01	FCC	S6016	Shutdown work on Hydrogen Recycle Compressor-CRR	0.5	0.70	0.01	0.16	1	4	0.01	CRR	17	
10/10/01	siso	S6012	Shutdown work on Hydrogen Recycle Compressor-CRR	1.2	0.37	0.02	0.15	1	5	0.01	CRR	35	
10/11/01	SISO	S6012	Loss of 3 boosters during TKN startup	2.6	1.27	0.14	0.16	12	36	0.2	EPI	239	
10/11/01	FCC	S6016	Loss of 3 boosters during TKN startup	1.7	2.82	0.20	0.15	6	50	0.1	EPI	347	

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
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Chevron													District's VOC Estimate	
(Purge and pilot gas not included)														
	Flare	Flare	Flow Rate to Flare			Duration	Released Volume	H2S	Release amounts (lbs.)					
Date	Name	Number	Cause			(MMSCFD)	(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)
10/17/01	D&R	S6010	#5 Rheniformer S/D flare activity			0.2	1.50	0.01	0.45	1	9	0	EPI	22
10/17/01	D&R	S6010	#5 Rheniformer S/D flare activity			1.5	0.50	0.03	0.5	2	26	0	EPI	54
10/18/01	ISO	S6012	Shutdown work on Hydrogen Recycle Compressor-CRR			1.2	7.00	0.35	0.2	14	116	0.2	CRR	609
10/19/01	FCC	S6016	FCC maintenance - CRR			0.7	1.50	0.04	0.4	5	29	0.1	CRR	70
10/20/01	FCC	S6016	FCC maintenance - CRR			0.7	24.00	0.70	0.1	80	121	1.2	CRR	1219
10/21/01	FCC	S6016	FCC maintenance - CRR			0.7	24.00	0.70	0.05	80	58	1.2	CRR	1219
10/22/01	FCC	S6016	FCC maintenance - CRR			0.12	3.65	0.02	0	3	0	0	CRR	35
10/26/01	NISO	S6013	Flaring from RLOP flare due to R-410 / R-411 depressuring			1.5	1.00	0.06	4	3	414	0.1	EPI	109
10/26/01	NISO	S6013	TKC Shutdown Maintenance Work-CRR			1.4	10.15	0.59	4.3	21	4214	0.3	CRR	1027
10/27/01	NISO	S6013	TKC Shutdown Maintenance Work-CRR			1.9	5.43	0.43	3.5	12	2492	0.2	CRR	749
10/28/01	NISO	S6013	TKN partial sequential dump due to software problem			0.9	1.00	0.04	5	2	341	0	EPI	65
10/28/01	NISO	S6013	TKN partial sequential dump due to software problem			1.9	1.78	0.14	3.5	4	818	0.1	EPI	246
10/28/01	NISO	S6013	TKC Shutdown Maintenance Work-CRR			1.9	6.53	0.52	3.5	14	2996	0.2	CRR	906
10/29/01	NISO	S6013	TKC Shutdown Maintenance Work-CRR			1.9	4.75	0.38	3.5	10	2178	0.02	CRR	662
11/1/01	NISO	S6013	TKC Shutdown Maintenance Work-CRR			1.9	1.10	0.09	4.5	2	649	0	CRR	157
11/2/01	NISO	S6013	TKC Shutdown Maintenance Work-CRR			1.9	3.27	0.26	4.5	7	1926	0.1	CRR	453
11/4/01	NISO	S6013	TKC Shutdown Maintenance Work-CRR			1.84	0.83	0.06	1.3	2	138	0	CRR	104
11/4/01	FCC	S6016	Flaring from unknown source while FRG @ 100%.			0.2	16.00	0.13	0	11	0	0.2	EPI	232
11/5/01	Isomax	S6013	TKC Shutdown Maintenance Work-CRR			1.84	4.67	4.67	0.36	10	770	0.1	CRR	8132
11/6/01	NISO	S6013	Loss of K-500 Shutdown lube oil pumps accidentally when K-400 lube oil pumps were being shutdown.			2.61	2.50	0.27	5.25	12	2362	0.2	EPI	473
11/6/01	NISO	S6013	Loss of K-500 Shutdown lube oil pumps accidentally when K-400 lube oil pumps were being shutdown.			27.92	0.25	0.29	5.25	12	2527	0.2	EPI	506
11/8/01	FCC	S6016	Loss of FGR .Compressors. Shut down due to high level in V-1051 (KO). RQ for NO.			4.58	1.12	0.21	0	11	0	0.2	EPI	371
11/11/01	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2	2.00	0.17	5.52	7	1523	0.1	CRR	296
11/16/01	SISO	S6012	C-126 safety valve lifted, causing flaring for 16 minutes.			15.26	0.27	0.17	0.5	12	140	0.2	EPI	295

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
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Chevron Reported Data														District's VOC Estimate
Chevron			(Purge and pilot gas not included)											
	Flare	Flare				Flow Rate to Flare	Duration	Released Volume	H2S	Release amounts (lbs.)				
Date	Name	Number	Cause			(MMSCFD)	(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)
11/16/01	D&R	S6010	K-1600 Shutdown due to high level in V-1600			2	5.00	0.42	0.06	22	38	0.3	EPI	726
11/16/01	D&R	S6010	K-1600 Shutdown due to high level in V-1600			4.5	11.00	2.06	0.04	109	131	1.7	EPI	3592
11/17/01	RLOP	S6013	TKC Shutdown Maintenance Work-CRR			1.5	1.00	0.06	3	3	310	0.1	CRR	104
11/17/01	FCC	S6013	TKC Shutdown Maintenance Work-CRR			1.5	9.00	0.56	0	30	0	0.5	CRR	975
11/18/01	D&R	S6010	Flaring at LSFO due to failed LCV on flare seal level.			1.6	7.23	0.48	0.1	10	80	0.1	EPI	840
11/20/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			0.06	16.05	0.04	5	2	332	0	CRR	70
11/20/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			0.75	8.00	0.25	5	13	2055	0.2	CRR	435
11/20/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.5	5.05	0.53	4.5	14	3918	0.2	CRR	923
11/20/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.5	6.95	0.72	4.1	23	4913	0.3	CRR	1254
11/20/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.5	12.00	1.25	5.5	39	11379	0.6	CRR	2177
11/21/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			0.06	23.32	0.06	5	3	482	0	CRR	104
11/21/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.5	3.37	0.35	3.5	15	2032	0.2	CRR	609
11/21/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.5	5.45	0.57	4.5	15	4228	0.2	CRR	993
11/21/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.5	14.50	1.51	4.5	40	11249	0.6	CRR	2630
11/24/01	D&R	S6010	K-3950 Shutdown due to instrumentation problem or lack of gas to pump			1.5	6.40	0.40	0.08	9	53	0.1	EPI	697
11/28/01	D&R	S6010	K-3950 shutdown due to unknown cause.			1.2	8.50	0.43	0.05	10	35	0.1	EPI	740
11/30/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.76	3.75	0.43	4.5	11	3212	0.2	CRR	749
11/30/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.76	4.00	0.46	2.8	15	2665	0.2	CRR	801
11/30/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.76	15.25	1.75	2.4	46	6966	0.7	CRR	3047
12/1/01	D&R	S6010	K-3950 shutdown on nightshift due to low suction pressure			1.5	0.17	0.01	0.05	0	1	0	EPI	18
12/1/01	D&R	S6010	K-3950 shutdown on nightshift due to low suction pressure			1.5	0.67	0.04	0.05	1	3	0	EPI	73
12/1/01	D&R	S6010	K-3950 shutdown on nightshift due to low suction pressure			1.5	0.67	0.04	0.05	1	3	0	EPI	73
12/1/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.76	3.00	0.35	2.2	11	1256	0.2	CRR	609
12/1/01	D&R	S6010	K-3950 shutdown on nightshift due to low suction pressure			1.5	5.83	0.36	0.05	8	30	0.1	EPI	635
12/1/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.76	5.75	0.66	3	21	3283	0.3	CRR	1149

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
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Chevron Reported Data													District's VOC Estimate	
Chevron			(Purge and pilot gas not included)							Chevron Reported Data				
	Flare	Flare				Flow Rate to Flare	Duration	Released Volume	H2S	Release amounts (lbs.)				75% HC 44 MW 98% eff
Date	Name	Number	Cause			(MMSCFD)	(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)
12/1/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.76	7.00	0.81	2.2	21	2931	0.3	CRR	1411
12/1/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.76	8.25	0.95	2.4	25	3769	0.4	CRR	1654
12/2/01	D&R	S6010	K-3950 shutdown on nightshift due to low suction pressure			1.5	4.33	0.27	0.05	6	22	0.1	EPI	472
12/2/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.76	2.92	0.34	7	9	3886	0.1	CRR	592
12/2/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.76	3.50	0.40	7	13	4663	0.2	CRR	697
12/2/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.76	5.25	0.60	3	19	2998	0.3	CRR	1045
12/3/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.66	8.92	0.99	4	52	6543	0.8	CRR	1724
12/3/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.66	15.08	1.67	5.3	88	14664	1.4	CRR	2908
12/4/01	NISO	S6013	TKN / ISO Maintenance Work (CRR)			2.66	6.28	0.70	5.3	37	6109	0.6	CRR	1219
12/6/01	RLOP	S6039	K-1900 shutdown due to Honeywell cutovers			15.8	3.00	1.98	14	104	45762	1.6	EPI	3439
12/13/01	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR			1	3.83	0.16	0	14	0	0.2	CRR	279
12/13/01	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR			1.8	3.92	0.29	0.7	12	340	0.2	CRR	505
12/13/01	D&R	S6010	K-3950 S/D on low suction pressure			1.5	4.75	0.30	0.05	8	25	0.1	EPI	517
12/16/01	ALKY	S6019	Alky C-400 pressure control upset			6.4	0.33	0.09	0	7	0	0.1	EPI	155
12/29/01	SISO	S6012	K-1060 S/D due to high vibration			2.64	3.72	0.41	0.05	20	42	0.3	EPI	712
1/8/02	FCC	S6016	K-1070 shutdown due to maintenance			4	0.70	0.12	0.66	10	127	0.2	EPI	203
1/10/02	D&R	S6010	4CAT startup			0.25	3.00	0.03	1	1	10	0.01	EPI	54
1/14/02	RLOP	S6039	RLOP Shutdown Maintenance Work (CRR)			1.2	5.83	0.29	3.5	10	1690	0.2	CRR	505
1/15/02	RLOP	S6039	RLOP Shutdown Maintenance Work (CRR)			1.2	5.00	0.25	3	5	1241	0.1	CRR	435
1/15/02	RLOP	S6039	RLOP Shutdown Maintenance Work (CRR)			1.2	14.00	0.70	2.5	13	2896	0.2	CRR	1219
1/16/02	RLOP	S6039	RLOP Shutdown Maintenance Work (CRR)			0.5	14.00	0.29	6	7	2896	0.1	CRR	505
1/17/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)			5.95	0.03	0.01	0.01	0	0	0	CRR	17
1/17/02	RLOP	S6039	RLOP Shutdown Maintenance Work (CRR)			0.5	8.00	0.17	3	7	828	0.1	CRR	296
1/17/02	RLOP	S6039	RLOP Shutdown Maintenance Work (CRR)			0.5	10.00	0.21	3	8	1034	0.1	CRR	366
1/17/02	RLOP	S6039	RLOP Shutdown Maintenance Work (CRR)			0.5	16.00	0.33	0	13	0	0.2	CRR	575

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
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Chevron													District's VOC Estimate
(Purge and pilot gas not included) Chevron Reported Data													
	Flare	Flare	Flow Rate to Flare			Duration	Released Volume	H2S	Release amounts (lbs.)				
Date	Name	Number	Cause	(MMSCFD)		(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)
1/18/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	15		0.47	0.29	0	6	0	0.1	CRR	505
1/18/02	RLOP	S6039	RLOP Shutdown Maintenance Work (CRR)	0.5		24.00	0.50	0	37	0	0.6	CRR	871
1/18/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	3		16.83	2.10	0	28	7	0.4	CRR	3657
1/19/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	2.5		0.75	0.08	0	1	0	0	CRR	139
1/19/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	0.37		5.83	0.09	0	0	0	0	CRR	157
1/19/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	3		1.17	0.15	0.01	2	3	0	CRR	261
1/19/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	2.5		7.50	0.78	0	6	0	0.1	CRR	1358
1/20/02	RLOP	S6039	RLOP Shutdown Maintenance Work (CRR)	1.1		8.00	0.37	0	43	0	0.7	CRR	644
1/21/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.25		1.50	0.08	0	1	0	0	CRR	139
1/21/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	20		0.83	0.69	0	20	0	0.3	CRR	1202
1/24/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.2		4.00	0.20	0	1	0	0	CRR	348
1/24/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1		5.33	0.22	0	9	0	0.1	CRR	383
1/24/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	3.6		3.50	0.53	0	21	0	0.3	CRR	923
1/24/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	3.6		10.00	1.50	0	6	0	0.1	CRR	2612
1/25/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1		24.00	1.00	0	39	0	0	CRR	1741
1/26/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	0.53		4.17	0.09	0	2	0	0	CRR	157
1/27/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1		24.00	1.00	0	31	0	0.5	CRR	1741
1/28/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	2.6		0.03	0.00	0	0	0	0	CRR	0
1/28/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown	2.6		0.20	0.02	0	1	0	0	CRR	35

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Chevron													District's VOC Estimate
(Purge and pilot gas not included)													
	Flare	Flare		Flow Rate to Flare	Duration	Released Volume	H2S	Chevron Reported Data					
Date	Name	Number	Cause	(MMSCFD)	(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)	75% HC 44 MW 98% eff
			Maintenance Work (CRR)										
1/28/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	0.5	5.50	0.11	0	4	0	0.1	CRR	192	
1/28/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	5.5	0.60	0.14	0	5	0	0.1	CRR	244	
1/28/02	D&R	S6011	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	3.1	11.00	1.42	0	56	0	0	CRR	2473	
1/29/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	0.01	4.00	0.00	0	0	0	0	CRR	3	
1/29/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	4.2	0.50	0.09	0	4	0	0.1	CRR	157	
1/29/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	2.6	3.67	0.40	0	16	0	0.2	CRR	697	
1/30/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	0.01	2.75	0.00	0	0	0	0	CRR	0	
1/30/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	0.5	0.17	0.00	0	0	0	0	CRR	0	
1/30/02	NISO	S6013	FGR compressor valves overheating	1.08	0.52	0.02	5	3	192	0	EPI	40	
1/30/02	NISO	S6013	FGR compressor valves overheating	1.83	0.65	0.05	5	2	365	0	EPI	86	
1/31/02	NISO	S6013	FGR shutdown due to liquid	3.5	0.83	0.12	2.23	8	449	0.1	EPI	212	
1/31/02	D&R	S6010	NISO off FGR due to problems with the SRU shutdown	2	2.00	0.17	0.05	9	14	0.1	EPI	290	
1/31/02	NISO	S6013	NISO off FGR due to problems with the SRU shutdown	3.5	2.57	0.37	2.23	24	1382	0.4	EPI	652	
2/1/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	0.14	10.00	0.06	0	2	0	0	CRR	104	
2/2/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	0.14	6.00	0.04	0	1	0	0	CRR	70	
2/9/02	SISO	S6012	SISO off FGR due to safety valve testing	0.64	4.77	0.13	0.1	8	21	0.1	EPI	221	
2/16/02	SISO	S6012	SISO off FGR to facilitate removal of PSV from V-135 at SDA plant	0.37	1.35	0.02	0.1	1	3	0	EPI	36	
2/20/02	SISO	S6012	SISO off FGR for safety installation	0.72	0.97	0.03	0.1	1	5	0	EPI	51	
2/20/02	SISO	S6012	SISO off FGR for safety installation	0.93	3.05	0.12	0.1	5	20	0.1	EPI	206	
2/27/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown	1	14.00	0.58	0	3	0	0.3	CRR	1010	

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
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Chevron Reported Data													District's VOC Estimate
(Purge and pilot gas not included)													
	Flare	Flare		Flow Rate to Flare	Duration	Released Volume	H2S	Release amounts (lbs.)					
Date	Name	Number	Cause	(MMSCFD)	(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)	
			Maintenance Work (CRR)										
2/27/02	NISO	S6013	NISO off FGR due to TKN/TKC/ISO shutdown	1	22.30	0.93	1	51	2767	0	EPI	1618	
2/27/02	FCC&SI SO	S6016/S6 012	Poly Plant shutdown	2.6	13.00	1.41	0.05	89	117	1.4	EPI	2453	
2/28/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.5	10.00	0.63	0	22	0	0.3	CRR	1097	
2/28/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.5	24.00	1.50	0	53	0	0.8	CRR	2612	
3/1/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.5	24.00	1.50	0	53	0	0.8	CRR	2612	
3/2/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.5	24.00	1.50	0	53	0	0.8	CRR	2612	
3/3/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.5	24.00	1.50	0	53	0	0.8	CRR	2612	
3/4/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.5	24.00	1.50	0	53	0	0.8	CRR	2612	
3/5/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1	24.00	1.00	0	35	0	0.5	CRR	1741	
3/6/02	D&R	S6011	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.5	8.27	0.52	0.05	18	43	0.3	CRR	906	
3/6/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.5	14.88	0.93	0.05	33	77	0.5	CRR	1620	
3/7/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	0.75	1.50	0.05	0	1	0	0	CRR	87	
3/7/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.3	0.85	0.05	0	1	0	0	CRR	87	
3/7/02	D&R	S6011	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1	24.00	1.00	0.05	35	83	0.5	CRR	1741	
3/8/02	NISO	S6013	NISO off FGR due to RLOP startup (no calls made)	1.86	0.77	0.06	2	3	197	0	EPI	103	
3/8/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	2	24.00	2.00	0.05	70	166	1.1	CRR	3483	
3/9/02	RLOP	S6039	RLOP flared while starting up the GRU	4.8	10.00	2.00	2.5	143	8275	2.2	EPI	3483	
3/9/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	3.5	24.00	3.50	0.05	123	290	1.9	CRR	6095	

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
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Chevron													District's VOC Estimate
(Purge and pilot gas not included) Chevron Reported Data													
	Flare	Flare	Flow Rate to Flare			Duration	Released Volume	H2S	Release amounts (lbs.)				
Date	Name	Number	Cause	(MMSCFD)		(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)
3/10/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.75		7.67	0.56	0.38	30	352	0.5	CRR	975
3/10/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	2		16.33	1.36	0.05	48	113	0.7	CRR	2368
3/11/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.75		3.00	0.22	0.38	12	138	0.2	CRR	383
3/11/02	RLOP	S6039	RLOP flared when K-1900 went down due to high vibrations	5.2		3.17	0.69	8	22	9084	0.3	EPI	1195
3/11/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.75		21.00	1.53	0.05	54	127	0.8	CRR	2664
3/12/02	NISO	S6013	North Yard Flare Gas Recovery Maintenance - CRR	0.7		9.67	0.28	2.5	12	1167	0.2	CRR	488
3/12/02	RLOP	S6039	North Yard Flare Gas Recovery Maintenance - CRR	0.5		14.33	0.30	2.7	10	1334	0.2	CRR	522
3/12/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.5		14.50	0.30	0.5	13	250	0.2	CRR	522
3/12/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1		24.00	1.00	0	79	0	1.2	CRR	1741
3/12/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	3		24.00	3.00	0.05	105	248	1.6	CRR	5224
3/13/02	NISO	S6013	North Yard Flare Gas Recovery Maintenance - CRR	1.12		3.20	0.15	2	7	494	0.1	CRR	261
3/13/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.76		24.00	0.76	0.2	34	252	0.5	CRR	1323
3/13/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1		24.00	1.00	0	79	0	1.2	CRR	1741
3/13/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	2		24.00	2.00	0.05	70	166	1.1	CRR	3483
3/14/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.76		24.00	0.76	0.2	32	252	0.5	CRR	1323
3/14/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1		24.00	1.00	0.05	35	83	0.5	CRR	1741
3/14/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1		24.00	1.00	0	75	0	1.2	CRR	1741
3/15/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.14		24.00	1.14	0	48	0	0.7	CRR	1985
3/16/02	NISO	S6013	North Yard Flare Gas Recovery Maintenance - CRR	0.6		2.50	0.06	6.5	3	672	0	CRR	104
3/16/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.76		24.00	0.76	0.2	37	252	0.6	CRR	1323
3/16/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1		24.00	1.00	0	80	0	1.2	CRR	1741
3/17/02	NISO	S6013	Hydrogen blowing through K-400 sour seal oil traps to relief	0.5		0.75	0.02	6.5	0	168	0	EPI	27

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
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Chevron													District's VOC Estimate
(Purge and pilot gas not included)													
	Flare	Flare		Flow Rate to Flare	Duration	Released Volume	H2S	Chevron Reported Data					
Date	Name	Number	Cause	(MMSCFD)	(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)	75% HC 44 MW 98% eff
3/17/02	FCC	S6016	Equipment failure	5	0.42	0.09	3	6	431	0.1	EPI	151	
3/17/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1	15.50	0.65	0	36	0	0.6	CRR	1132	
3/17/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.76	24.00	0.76	0.2	28	252	0.4	CRR	1323	
3/18/02	RLOP	S6039	Flared when K-1900 went down	0.543056	2.27	0.05	5	15	3126	0.2	EPI	89	
3/18/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1	24.00	1.00	0.2	59	0	0.9	CRR	1741	
3/19/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.76	24.00	0.76	0.1	27	126	0.4	CRR	1323	
3/19/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1	24.00	1.00	0	60	0	0.9	CRR	1741	
3/20/02	D&R	S6010	DHT depressure	0.4	0.42	0.01	0.45	0	5	0	EPI	12	
3/20/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	0.4	0.42	0.01	0.45	0	5	0	CRR	17	
3/20/02	D&R	S6010	DHT depressure	5.5	0.38	0.09	2.5	3	364	0	EPI	153	
3/20/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	5.5	0.38	0.09	2.5	3	364	0	CRR	157	
3/20/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	2.5	4.13	0.43	1	15	713	0.2	CRR	749	
3/20/02	D&R	S6010	DHT depressure	2.5	4.13	0.43	1	15	713	0.2	EPI	750	
3/20/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.76	24.00	0.76	0	29	0	0.4	CRR	1323	
3/20/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1	24.00	1.00	0	83	0	1.3	CRR	1741	
3/21/02	D&R	S6010	DHT startup preparation	1.8	0.07	0.01	0.23	0	2	0	EPI	9	
3/21/02	D&R	S6010	DHT startup preparation	1	0.15	0.01	0.05	0	1	0	EPI	11	
3/21/02	D&R	S6010	DHT startup preparation	1	0.17	0.01	0.05	0	1	0	EPI	12	
3/21/02	D&R	S6010	DHT startup preparation	1	0.27	0.01	0.05	1	1	0	EPI	19	
3/21/02	D&R	S6010	PSV lifted	2.6	0.15	0.02	2.6	0	4	0	EPI	28	
3/21/02	D&R	S6010	DHT startup preparation	0.6	0.75	0.02	0.45	1	14	0	EPI	33	
3/21/02	D&R	S6010	DHT startup preparation	1.8	0.33	0.03	0.23	1	10	0	EPI	44	
3/21/02	D&R	S6010	DHT startup preparation	1.5	0.47	0.03	0.18	1	9	0	EPI	51	
3/21/02	D&R	S6010	DHT startup preparation	1.5	0.53	0.03	0.18	1	10	0	EPI	58	

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
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Chevron													District's VOC Estimate
(Purge and pilot gas not included)													
	Flare	Flare		Flow Rate to Flare	Duration	Released Volume	H2S	Chevron Reported Data					
Date	Name	Number	Cause	(MMSCFD)	(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)	75% HC 44 MW 98% eff
3/21/02	D&R	S6010	DHT startup preparation	1	2.03	0.08	0.05	4	7	0.1	EPI	148	
3/21/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.76	24.00	0.76	0	11	0	0.2	CRR	1323	
3/21/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1	24.00	1.00	0	94	0	1.5	CRR	1741	
3/22/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.76	24.00	0.76	0.2	30	252	0.5	CRR	1323	
3/22/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1	24.00	1.00	0	75	0	1.2	CRR	1741	
3/23/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.76	24.00	0.76	0.2	22	252	0.3	CRR	1323	
3/23/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1	24.00	1.00	0	11	0	0.2	CRR	1741	
3/24/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	0.8	24.00	0.80	0.2	24	265	0.4	CRR	1393	
3/24/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	1	24.00	1.00	0	107	0	1.7	CRR	1741	
3/25/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.7	24.00	0.70	0	64	0	1	CRR	1219	
3/25/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1.3	24.00	1.30	0.2	75	430	1.2	CRR	2264	
3/25/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	2.4	24.00	2.40	0.05	84	199	1.3	CRR	4179	
3/26/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.7	24.00	0.70	0	63	0	1	CRR	1219	
3/26/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1	24.00	1.00	0.2	50	331	0.8	CRR	1741	
3/26/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	2	24.00	2.00	0.05	126	166	1.9	CRR	3483	
3/27/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.74	24.00	0.74	0	70	0	1.1	CRR	1289	
3/27/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1	24.00	1.00	0.2	43	331	0.7	CRR	1741	
3/27/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	2	24.00	2.00	0.05	70	166	1.1	CRR	3483	
3/28/02	NISO	S6013	North Yard Flare Gas Recovery Maintenance - CRR	3.84	1.97	0.31	5	13	2604	0.2	CRR	540	
3/28/02	NISO	S6013	NISO off FGR due to relief work	3.84	1.97	0.31	5	13	2604	0.2	EPI	548	
3/28/02	FCC	S6016	FCC off FGR due to K-1060 down	0.74	24.00	0.74	0	58	0	0.9	EPI	1289	
3/28/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.74	24.00	0.74	0	58	0	0.9	CRR	1289	
3/28/02	SISO	S6012	SISO off FGR due to K-1-60 down	1	24.00	1.00	0.2	40	331	0.6	EPI	1741	
3/28/02	SISO	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1	24.00	1.00	0.2	40	331	0.6	CRR	1741	

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Chevron													District's VOC Estimate	
(Purge and pilot gas not included)														
	Flare	Flare	Flow Rate to Flare			Duration	Released Volume	H2S	Release amounts (lbs.)					
Date	Name	Number	Cause	(MMSCFD)			(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)
3/28/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.5		24.00	1.50	0.05	53	124	0.8	CRR	2612	
3/29/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	4		3.40	0.57	0.06	21	55	0.3	CRR	993	
3/29/02	D&R	S6010	4CAT startup	4		3.57	0.59	0.06	21	55	0.3	EPI	1035	
3/29/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.74		24.00	0.74	0	58	0	0.9	CRR	1289	
3/29/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1		24.00	1.00	0.1	40	166	0.6	CRR	1741	
3/30/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	0.4		1.48	0.02	21	1	9	0	CRR	35	
3/30/02	D&R	S6010	Flaring due to PSV off V-476 Sulfer Absorber	0.4		1.48	0.02	0.5	1	9	0	EPI	43	
3/30/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.74		24.00	0.74	0	25	0	0.4	CRR	1289	
3/30/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1		24.00	1.00	0.2	43	331	0.7	CRR	1741	
3/31/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.74		24.00	0.74	0	25	0	0.4	CRR	1289	
3/31/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1		24.00	1.00	0.4	43	662	0.7	CRR	1741	
4/1/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1		0.00	0.00	0.05	35	83	0.5	CRR	0	
4/1/02	RLOP	S6039	RLOP off FGR during 18 Plant startup	1.5		1.43	0.09	1	3	148	0	EPI	156	
4/1/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.74		24.00	0.74	0	55	0	0.8	CRR	1289	
4/1/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1		24.00	1.00	0.2	36	331	0.6	CRR	1741	
4/2/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1		0.00	0.00	0.05	35	83	0.5	CRR	0	
4/2/02	FCC	S6016	North Yard Flare Gas Recovery Maintenance - CRR	0.74		10.50	0.32	0	26	0	0.4	CRR	557	
4/2/02	siso	S6012	North Yard Flare Gas Recovery Maintenance - CRR	1		10.50	0.44	0.56	22	404	0.3	CRR	766	
4/3/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1		0.00	0.00	0.05	35	83	0.5	CRR	0	
4/4/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1		0.00	0.00	0.05	35	83	0.5	CRR	0	
4/5/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	2		0.00	0.00	0.05	70	166	1.1	CRR	0	
4/6/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	2		0.00	0.00	0.05	70	166	1.1	CRR	0	

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Chevron													District's VOC Estimate	
(Purge and pilot gas not included)														
	Flare	Flare	Flow Rate to Flare			Duration	Released Volume	H2S	Release amounts (lbs.)					
Date	Name	Number	Cause			(MMSCFD)	(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)
4/7/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)			2	0.00	0.00	0.05	70	166	1.1	CRR	0
4/8/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)			2	0.00	0.00	0.05	70	166	1.1	CRR	0
4/9/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)			2	0.00	0.00	0.05	70	166	1.1	CRR	0
4/10/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)			2.25	0.00	0.00	0.05	4	9	0.1	CRR	0
4/10/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)			2.25	0.00	0.00	0.05	1	1	0	CRR	0
4/11/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	2.00	0.17	3.2	6	900	0.1	CRR	296
4/11/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			0.55	9.50	0.22	7	10	2522	0.1	CRR	383
4/11/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			0.65	8.50	0.23	7	10	2667	0.2	CRR	401
4/11/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.02	3.58	0.30	3.2	11	1613	0.2	CRR	522
4/11/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	16.17	1.37	3.9	47	8870	0.7	CRR	2386
4/12/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			0.15	5.00	0.03	7	1	362	0	CRR	52
4/12/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			0.45	2.00	0.04	7	2	435	0	CRR	70
4/12/02	NISO	S6013	NISO off FGR as part of shutting down and cleaning up the TKC plant			2.04	1.50	0.13	1.8	6	380	0.1	EPI	222
4/12/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	1.50	0.13	1.8	6	380	0.1	CRR	226
4/12/02	D&R	S6010	LSFO off FGR as a result of liquid to the liquid to the K-3950. Due to problems at the SRU, LSFO was kept off of FGR.			2.3	8.45	0.81	0.51	34	684	0.5	EPI	1410
4/12/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	22.50	1.91	3.2	69	10129	1.1	CRR	3326
4/13/02	RLOP	S6039	RLOP off FGR as a result of problems at the SRU			2	1.00	0.08		5	152	1.1	EPI	145
4/13/02	FCC	S6016	FCC off FGR as a result of problems at the SRU			1	11.50	0.48	0	45	0	0.7	EPI	834
4/13/02	Alky-Poly	FALSE	A&P off FGR as a result of problems at the SRU			1	11.50	0.48	0	59	0	0.9	EPI	834
4/13/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	6.00	0.51	1.73	16	1460	0.3	CRR	888
4/13/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			1	13.00	0.54	0.3	32	269	0.5	CRR	940

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Chevron Reported Data														District's VOC Estimate
Chevron			(Purge and pilot gas not included)											
	Flare	Flare				Flow Rate to Flare	Duration	Released Volume	H2S	Release amounts (lbs.)				
Date	Name	Number	Cause			(MMSCFD)	(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)
4/13/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	9.00	0.77	1.8	37	2279	0.6	CRR	1341
4/13/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	9.00	0.77	1.56	44	1975	0.7	CRR	1341
4/14/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	3.50	0.30	1.55	17	763	0.3	CRR	522
4/14/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	9.00	0.77	0.4	21	506	0.3	CRR	1341
4/14/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	11.50	0.98	0.62	56	1003	0.9	CRR	1707
4/15/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	3.00	0.26	0.4	7	169	0.1	CRR	453
4/15/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	9.00	0.77	0.38	24	481	0.4	CRR	1341
4/15/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	12.00	1.02	0.45	34	760	0.5	CRR	1776
4/16/02	FCC	S6016	FCC off FGR due to overpressure			0.96	0.08	0.00	0.05	0	0	0	EPI	6
4/16/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	3.00	0.26	0.38	8	160	0.1	CRR	453
4/16/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	9.00	0.77	0.39	23	494	0.4	CRR	1341
4/16/02	Niso	S6013	TKC Shutdown Maintenance Work-CRR			2.04	12.00	1.02	0.38	32	642	0.5	CRR	1776
4/17/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	3.00	0.26	0.39	8	165	0.1	CRR	453
4/17/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.07	12.00	1.04	0.6	27	1013	0.4	CRR	1811
4/18/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	9.00	0.77	0.4	20	506	0.3	CRR	1341
4/18/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	10.00	0.85	0.4	22	563	0.3	CRR	1480
4/19/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	7.00	0.60	0.58	15	374	0.2	CRR	1045
4/19/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	7.00	0.60	0.67	19	660	0.3	CRR	1045
4/19/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	10.00	0.85	0.56	22	788	0.3	CRR	1480
4/20/02	RLOP	S6039	RLOP Shutdown Maintenance Work (CRR)			2.9	0.62	0.07	3	3	370	0.1	CRR	122
4/20/02	NISO	S6013	TKC Shutdown Maintenance			2.04	3.00	0.26	0.87	8	367	0.1	CRR	453
4/20/02	NISO	S6013	TKC Shutdown Maintenance Work-CRR			2.04	7.00	0.60	0.75	16	739	0.2	CRR	1045
4/20/02	NISO	S6013	TKC Shutdown Maintenance			2.04	7.00	0.60	0.87	18	857	0.3	CRR	1045
4/20/02	NISO	S6013	TKC Shutdown Maintenance			2.04	12.00	1.02	0.57	26	962	0.4	CRR	1776
4/21/02	NISO	S6013	TKC Shutdown Maintenance			2.04	6.50	0.55	0.3	17	274	0.3	CRR	958

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Chevron													District's VOC Estimate
(Purge and pilot gas not included)													
	Flare	Flare		Flow Rate to Flare	Duration	Released Volume	H2S	Chevron Reported Data					
Date	Name	Number	Cause	(MMSCFD)	(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)	75% HC 44 MW 98% eff
4/23/02	NISO	S6013	NISO flared due to high hydrocarbons in 4 H2S plant hitting SRU's	2.2	0.20	0.02	3	1	91	0	EPI	32	
4/23/02	RLOP	S6039	RLOP flared due to troubleshooting high hydrocarbons in 4 H2S plant hitting SRU's	2.3	0.55	0.05	3	2	262	0	EPI	92	
4/24/02	D&R	S6010	Loss of K-3950	1.72	0.70	0.05	0.05	1	4	0	EPI	87	
4/24/02	D&R	S6010	Loss of K-3950	0.72	4.85	0.15	0.05	4	12	0.1	EPI	253	
4/25/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	2.2	0.17	0.02	0.05	0	1	0	CRR	35	
4/25/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	2.2	2.72	0.25	0.05	6	21	0.1	CRR	435	
4/28/02	D&R	S6010	Loss of K-3950	1.2	19.00	0.95	0.05	20	79	0.3	EPI	1654	
4/29/02	SISO	S6012	SISO off FGR	1	0.80	0.03	0.3	2	17	0	EPI	58	
4/30/02	NISO	S6013	TKC Shutdown Maintenance	11.5	0.58	0.28	3	15	1388	0.2	CRR	488	
4/30/02	NISO	S6013	TKC Shutdown Maintenance	1.44	15.17	0.91	3.2	18	4820	0.3	CRR	1585	
5/3/02	D&R	S6010	Flare Gas Recovery (FGR) Compressor K-3950 Shurdown Maintenance Work (CRR)	1.75	6.43	0.47	0.05	17	39	0.3	CRR	818	
5/5/02	D&R	S6010	K-3950 was shut down to assist in operational troubleshooting	1.75	2.42	0.18	0.05	6	15	0.1	EPI	307	
5/6/02	D&R	S6010	K-3950 was shut down to assist in operational troubleshooting	2.5	9.67	1.01	5	54	8333	0.8	EPI	1754	
5/9/02	SISO	S6012	K-1060/K-1070 were down due to high liquid content in the feed	6.13	0.08	0.02	5	1	176	0	EPI	37	
5/12/02	D&R	S6010	FGR slightly overloaded	0.25	18.00	0.19	0.05	4	14	0.1	EPI	327	
5/14/02	RLOP	S6039	K-1060/K-1070 shutdown due to high liquid level in the suction knockout drum V-1050	1.2	1.27	0.06	3	3	356	0.1	EPI	110	
5/14/02	FCC	S6016	K-1060/K-1070 shutdown due to high liquid level in the suction knockout drum V-1050	1.6	1.37	0.09	0	8	0	0.1	EPI	159	
5/14/02	NISO	S6013	K-1060/K-1070 shutdown due to high liquid level in the suction knockout drum V-1050	2	1.50	0.13	2.5	3	517	0	EPI	218	
5/14/02	SISO	S6012	K-1060/K-1070 shutdown due to high liquid level in the suction knockout drum V-1050	2.4	3.38	0.34	0.8	27	448	0.4	EPI	589	
5/15/02	NISO	S6013	TKC Shutdown Maintenance	1.78	0.23	0.02	0	1	143	2	CRR	35	

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Chevron													District's VOC Estimate	
(Purge and pilot gas not included)														
	Flare	Flare	Flow Rate to Flare			Duration	Released Volume	H2S	Release amounts (lbs.)					
Date	Name	Number	Cause			(MMSCFD)	(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)
5/15/02	NISO	S6013	TKC Shutdown Maintenance			45	0.10	0.19	0	3	0	0	CRR	331
5/18/02	RLOP	S6039	Loss of K-1900 due to plugging of E-1910/1901			7.8	0.10	0.03	0.76	0	140	0	EPI	57
5/18/02	RLOP	S6039	Loss of K-1900 due to plugging of E-1910/1901			6.8	0.17	0.05	1.1	0	204	0.01	EPI	82
5/18/02	RLOP	S6039	Loss of K-1900 due to plugging of E-1910/1901			14.8	0.08	0.05	1.2	0	222	0.01	EPI	89
5/18/02	RLOP	S6039	K-1900 shutdown due to high vibration			7.78	2.18	0.71	0.41	33	480	0.5	EPI	1233
5/18/02	RLOP	S6039	K-1900 shutdown due to high vibration			8.08	2.17	0.73	0.41	34	495	0.5	EPI	1270
5/19/02	NISO	S6013	K-1900 shutdown due to high vibration			0.5	1.58	0.03	7	2	382	0	EPI	57
5/19/02	NISO	S6013	K-600 was shutdown for coupling repairs (FGR off)			0.48	11.25	0.23	7	6	2607	0.1	EPI	392
5/19/02	FCC	S6016	K-1900 shutdown due to high vibration			1.6	5.00	0.33	0	22	0	0.3	EPI	580
5/19/02	NISO	S6013	K-600 was shutdown for coupling repairs (Reactors depressured)			1	11.00	0.46	0.45	12	341	0.2	EPI	798
5/19/02	SISO	S6012	K-1900 shutdown due to high vibration			2.2	19.00	1.74	0.2	70	577	1.1	EPI	3033
5/20/02	SISO	S6012	K-1900 shutdown due to high vibration			1.2	2.50	0.13	0.2	5	41	0.1	EPI	218
5/20/02	FCC	S6016	K-1900 shutdown due to high vibration			1.2	5.00	0.25	0	16	0	0.3	EPI	435
5/21/02	FCC	S6016	K-1900 shutdown due to high vibration			0.96	0.83	0.03	0	2	0	0	EPI	58
5/23/02	D&R	S6010	C-4410 experienced pressure problems, venting to relief			0.5	0.30	0.01	0.5	0	5	0	EPI	11
5/27/02	siso	S6012	K-1060 Maintenance-CRR			1.2	24.00	1.20	0.14	36	278	0.6	CRR	2090
5/27/02	FCC	S6016	K-1060 Maintenance-CRR			1.66	24.00	1.66	0	126	0	1.9	CRR	2891
5/28/02	siso	S6012	K-1060 Maintenance-CRR			1.2	12.00	0.60	0.11	32	110	0.5	CRR	1045
5/29/02	D&R	S6010	C-1190 pressured up due to high amount of light products in crude slate and heat of the day			0.5	0.05	0.00	0.05	0	0	0	EPI	2
5/29/02	D&R	S6010	C-1190 pressured up due to high amount of light products in crude slate and heat of the day			0.25	0.43	0.00	0.05	0	1	0	EPI	8
5/29/02	D&R	S6010	C-1190 pressured up due to high amount of light products in crude slate and heat of the day			0.25	3.15	0.03	0.05	1	3	0	EPI	57
5/30/02	D&R	S6010	C-1190 pressured up due to high amount of light products in crude slate and heat of the day			0.5	0.73	0.02	0.05	1	1	0	EPI	27
5/31/02	D&R	S6010	K-3950 shutdown due to electrical and instrumentation problems			0.9	7.07	0.27	0.05	13	44	0.2	EPI	461

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Chevron												District's VOC Estimate	
(Purge and pilot gas not included) Chevron Reported Data													
	Flare	Flare	Flow Rate to Flare			Duration	Released Volume	H2S	Release amounts (lbs.)				
Date	Name	Number	Cause	(MMSCFD)			(Hours)	(MMSCF)	%	NO	SO2	NO2	Source
6/5/02			Leaking PSV on FGR compressor (K-1171) reduced FGR compressors capacity.				0.80						Mo 1386
6/6/02			Relay on FGR compressor (K-3950) keep tripping off. Time is 8 periods summed together.				0.38						Mo 655
6/6/02			Leaking PSV in RLOP system; low confidence in flow estimation				0.10						Mo 168
6/8/02			Compressor out of service										Mo 0
6/9/02			Leaking PSV in RLOP system; low confidence in flow estimation				0.05						Mo 81
6/11/02			Replace PSV in FGR compressors; each compressor down one at a time while PSV fixed				0.03						Mo 51
6/13/02			Compressor maintenance?										Mo 0
6/17/02			Planned maintenance on compressors				1.70						Mo 2960
6/18/02			Leaking PSV in H2 Plant; low confidence in flow estimation				0.10						Mo 169
6/29/02			Power supply problems to the compressor. Mechanical problems on a vent gas recovery compressor.				1.28						Mo 2220
6/30/02			Power supply problems to the compressor. Mechanical problems on a vent gas recovery compressor.				2.00						Mo 3483
7/1/02			NY FGR compressor shut down due to high temp				1.49						Mo 2595
7/1/02			FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.				1.77						Mo 3082
7/2/02			FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.				0.31						Mo 540
7/2/02			NY FGR compressor repairs and modifications to prevent plugging				2.50						Mo 4354
7/3/02			FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.				0.21						Mo 366
7/3/02			NY FGR compressor repairs and modifications to prevent plugging				2.50						Mo 4354
7/4/02			FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.				0.50						Mo 871
7/4/02			NY FGR compressor repairs and modifications to prevent plugging				1.40						Mo 2438
7/5/02			FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.				0.33						Mo 575
7/5/02			NY FGR compressor repairs and modifications to prevent plugging				0.70						Mo 1219
7/6/02			FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.				0.38						Mo 662
7/6/02			NY FGR compressor repairs and modifications to prevent plugging				0.70						Mo 1219

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
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Chevron												(Purge and pilot gas not included)					District's VOC Estimate
	Flare	Flare					Flow Rate to Flare		Duration	Released Volume	H2S	Release amounts (lbs.)					75% HC 44 MW 98% eff
Date	Name	Number	Cause			(MMSCFD)			(Hours)	(MMSCF)	%	NO	SO2	NO2	Source	(lbs)	
7/7/02			FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.							0.80						Mo	1393
7/7/02			NY FGR compressor repairs and modifications to prevent plugging							0.70						Mo	1219
7/8/02			FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.							0.75						Mo	1306
7/8/02			NY FGR compressor repairs and modifications to prevent plugging							1.26						Mo	2194
7/9/02			FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.							0.38						Mo	662
7/9/02			NY FGR compressor repairs and modifications to prevent plugging							0.83						Mo	1445
7/10/02			FGR compressor power supply problem. Vent gas recovery compressor mechanical problems.							0.42						Mo	731
7/12/02			K-1171 shutdown due to hot valve.							0.00						Mo	5
7/12/02			Unknown							0.08						Mo	131
7/17/02			Loss of K-1900 due to low lube oil pressure.							0.09						Mo	150
7/23/02			Shutdown D&R FGR for PSV removal on K-900							0.02						Mo	35
8/5/02			After 20 Plant startup, the gas to K-1900 became lighter than normal and the machine vented to relief until moves could be made to stabilize it.							0.01						Mo	17
8/6/02			NY FGR pressured up due to PRD in RLOP leaking							0.11						Mo	192
8/7/02			NY FGR pressured up due to PRD in RLOP leaking							0.15						Mo	261
8/8/02			NY FGR pressured up due to PRD in RLOP leaking							0.08						Mo	139
8/17/02			SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed							0.30						Mo	522
8/18/02			SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed							0.54						Mo	940
8/19/02			SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed							0.54						Mo	940
8/20/02			SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed							0.54						Mo	940
8/21/02			SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed							0.54						Mo	940
8/22/02			SISO off FGR due to K-1060 down for maintenance-the 1st stage suction failed							0.46						Mo	801
8/27/02			Vent gas recovery compressor K-1171 taken out of relief service							0.03						Mo	52

**Note:** CRR is from Chevron's Continuous Release Report (CRR)

EPI is from Chevron's reported Episodic Flare Event Information (May 01-May 02)

Mo is from Chevron's reported monthly data for June, July, Aug 02

**Data supplied by Chevron except for last column which is the District's emission estimate based on information supplied by Chevron**  
**Purge and pilot flows are not included above**

**Average daily value for reported data is**

**2      tons**

**Includes Purge and Pilot  
Gas**

**Maximum reported value is**

**5      tons**

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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**B. Valero**

<b>Valero Reported Data</b>		Does not include pilot and purge gas							<b>District's Cal VOC (lbs)</b>
<b>DATE</b>	<b>CAUSE/COMMENTS</b>	<b>MMSCF</b>	<b>BTU/SCF</b>	<b>Mol. Wt.</b>	<b>H2S</b>	<b>H2</b>	<b>N2</b>	<b>SO2</b>	
									75% HC 44 MW 98% eff
<b>Valero Historical Data</b>									
6/1/01		0.86							1498
6/2/01		0.26							453
6/3/01		0.02							35
6/4/01		0.25							435
6/5/01		0.48							836
6/6/01		1.73							3013
6/7/01		1.97							3431
6/8/01		1.27							2212
6/9/01		0.05							87
6/10/01		0.24							418
6/11/01		0.32							557
6/12/01		0.21							366
6/13/01		0.23							401
6/14/01		0.49							853
6/15/01		1.08							1881
6/16/01		1.64							2856
6/17/01		0.58							1010
6/18/01		0.39							679
6/19/01		1.07							1863
6/20/01		1.36							2368
6/21/01		1.07							1863

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
6/22/01		0.2							348
6/23/01		2.82							4911
6/24/01		2.95							5137
6/25/01		2.96							5155
6/26/01		2.69							4684
6/27/01		3.27							5694
6/28/01		1.87							3256
6/29/01		0.72							1254
6/30/01		0.03							52
7/1/01		0.2							348
7/2/01		0.03							52
7/3/01		0.11							192
7/4/01		0.17							296
7/5/01		0.31							540
7/6/01		0.06							104
7/7/01		0.24							418
7/8/01		0.05							87
7/9/01		0.06							104
7/10/01		0.01							17
7/11/01		0.34							592
7/12/01		4.42							7697
7/13/01		0.07							122
7/14/01		0							0
7/15/01		0.1							174
7/16/01		0.35							609

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
7/17/01		0.12							209
7/18/01		0							0
7/19/01		1.44							2508
7/20/01		0.39							679
7/21/01		0.39							679
7/22/01		0.35							609
7/23/01		0.3							522
7/24/01		0.22							383
7/25/01		0.18							313
7/26/01		0.04							70
7/27/01		0.13							226
7/28/01		0.78							1358
7/29/01		0.49							853
7/30/01		0.04							70
7/31/01		0.01							17
8/1/01		0.46							801
8/2/01		0.04							70
8/3/01		0.3							522
8/4/01		0.09							157
8/5/01		0.08							139
8/6/01		0.02							35
8/7/01		2.09							3640
8/8/01		0.14							244
8/9/01		0.22							383
8/10/01		0.16							279

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
8/11/01		0.44							766
8/12/01		0.13							226
8/13/01		0.14							244
8/14/01		0.01							17
8/15/01		0.35							609
8/16/01		0.01							17
8/17/01		0.87							1515
8/18/01		0.2							348
8/19/01		0.66							1149
8/20/01		0.52							906
8/21/01		0.5							871
8/22/01		0.04							70
8/23/01		0.35							609
8/24/01		0.54							940
8/25/01		2.29							3988
8/26/01		1.97							3431
8/27/01		2.19							3814
8/28/01		1.06							1846
8/29/01		0.97							1689
8/30/01		1.87							3256
8/31/01		3.31							5764
9/1/01		2.65							4615
9/2/01		0.68							1184
9/3/01		0.34							592
9/4/01		1.29							2246

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
9/5/01		1.45							2525
9/6/01		1.45							2525
9/7/01		2.14							3727
9/8/01		2.09							3640
9/9/01		1.99							3465
9/10/01		2.07							3605
9/11/01		1.68							2926
9/12/01		0.96							1672
9/13/01		1.01							1759
9/14/01		1.32							2299
9/15/01		0.58							1010
9/16/01		0.4							697
9/17/01		0.87							1515
9/18/01		2.58							4493
9/19/01		0.79							1376
9/20/01		1.89							3291
9/21/01		2.61							4545
9/22/01		0.43							749
9/23/01		0.63							1097
9/24/01		0.19							331
9/25/01		1.33							2316
9/26/01		6.72							11702
9/27/01		6.71							11685
9/28/01		0.82							1428
9/29/01		0.17							296

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
9/30/01		2.02							3518
10/1/01		3.9							6792
10/2/01		0.15							261
10/3/01		0.17							296
10/4/01		0.34							592
10/5/01		0.1							174
10/6/01		0.35							609
10/7/01		0.4							697
10/8/01		0.35							609
10/9/01		1.02							1776
10/10/01		1.39							2421
10/11/01		2.07							3605
10/12/01		1.99							3465
10/13/01		1.36							2368
10/14/01		1.83							3187
10/15/01		2.24							3901
10/16/01		1.31							2281
10/17/01		1.31							2281
10/18/01		0.91							1585
10/19/01		0.38							662
10/20/01		1.25							2177
10/21/01		0.44							766
10/22/01		0.38							662
10/23/01		0.11							192
10/24/01		0.01							17

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
10/25/01		0.13							226
10/26/01		1.18							2055
10/27/01		0.28							488
10/28/01		0.2							348
10/28/01		0.24							418
10/29/01		0.1							174
10/30/01		0.17							296
10/31/01		0.21							366
11/1/01		0.31							540
11/2/01		0.03							52
11/3/01		0.15							261
11/4/01		0.02							35
11/5/01		0.9							1567
11/6/01		0.24							418
11/7/01		0.03							52
11/8/01		0.07							122
11/9/01		0.14							244
11/10/01		0.01							17
11/11/01		0.17							296
11/12/01		0.03							52
11/13/01		0.11							192
11/14/01		0.28							488
11/15/01		1.21							2107
11/16/01		0							0
11/17/01		0.2							348

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
11/18/01		0							0
11/19/01		0.67							1167
11/20/01		0.18							313
11/21/01		0.14							244
11/22/01		0.12							209
11/23/01		0.02							35
11/24/01		0.42							731
11/25/01		0.03							52
11/26/01		0.19							331
11/27/01		0.13							226
11/28/01		0.54							940
11/29/01		1.34							2334
11/30/01		2.55							4441
12/1/01		1.26							2194
12/2/01		0.86							1498
12/3/01		2.07							3605
12/4/01		5.01							8725
12/5/01		0.93							1620
12/6/01		0.66							1149
12/7/01		0.15							261
12/8/01		3.47							6043
12/9/01		0.05							87
12/10/01		0.73							1271
12/11/01		0.31							540
12/12/01		0.07							122

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
12/13/01		0.34							592
12/14/01		0.03							52
12/15/01		0.15							261
12/16/01		0.1							174
12/17/01		0.02							35
12/18/01		0.25							435
12/19/01		0.38							662
12/20/01		0.22							383
12/21/01		0.18							313
12/22/01		0.05							87
12/23/01		0.09							157
12/24/01		0.01							17
12/25/01		0							0
12/26/01		0.25							435
12/27/01		0							0
12/28/01		0.31							540
12/29/01		0.99							1724
12/30/01		0.17							296
12/31/01		0.98							1707
1/1/02		0.29							505
1/2/02		0.01							17
1/3/02		1.44							2508
1/4/02		0.3							522
1/5/02		0.49							853
1/6/02		1.98							3448

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
1/7/02		0.03							52
1/8/02		0.08							139
1/9/02		0.09							157
1/10/02		0.16							279
1/11/02		0.02							35
1/12/02		0.16							279
1/13/02		0.1							174
1/14/02		0.01							17
1/15/02		0.28							488
1/16/02		0.07							122
1/17/02		0.22							383
1/18/02		0.31							540
1/19/02		0.31							540
1/20/02		0.15							261
1/21/02		0.02							35
1/22/02		0.46							801
1/23/02		0.24							418
1/24/02		0.18							313
1/25/02		1.51							2630
1/26/02		1.59							2769
1/27/02		0.54							940
1/28/02		0.28							488
1/29/02		1.33							2316
1/30/02		1.33							2316
1/31/02		1.42							2473

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							District's Cal VOC (lbs)
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	
									75% HC 44 MW 98% eff
2/1/02		1.56							2717
2/2/02		0.11							192
2/3/02		0.17							296
2/4/02		0.03							52
2/5/02		1.18							2055
2/6/02		8.14							14175
2/7/02		13.14							22882
2/8/02		3.81							6635
2/9/02		0.17							296
2/10/02		1.47							2560
2/11/02		0.19							331
2/12/02		0							0
2/13/02		4.72							8220
2/14/02		9.54							16613
2/15/02		0.12							209
2/16/02		0							0
2/17/02		0.01							17
2/18/02		0.99							1724
2/19/02		0.02							35
2/20/02		0.01							17
2/21/02		1.04							1811
2/22/02		0.36							627
2/23/02		5.2							9055
2/24/02		5.59							9735
2/25/02		2.5							4354

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
2/26/02		0.62							1080
2/27/02		2.25							3918
2/28/02		5.2							9055
3/1/02		1.75							3047
3/2/02		0.01							17
3/3/02		2.45							4266
3/4/02		1.98							3448
3/5/02		1.06							1846
3/6/02		4.41							7680
3/7/02		4.52							7871
3/8/02		2.16							3761
3/9/02		0.91							1585
3/10/02		0.85							1480
3/11/02		1.28							2229
3/12/02		1.08							1881
3/13/02		0.97							1689
3/14/02		1.21							2107
3/15/02		0.9							1567
3/16/02		0.85							1480
3/17/02		1.93							3361
3/18/02		2.66							4632
3/19/02		2.06							3587
3/20/02		1.11							1933
3/21/02		1.02							1776
3/22/02		1.53							2664

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
3/23/02		0.02							35
3/24/02		0							0
3/25/02		0.01							17
3/26/02		0.12							209
3/27/02		0.01							17
3/28/02		0.01							17
3/29/02		1.47							2560
3/30/02		0.07							122
3/31/02		0.09							157
4/1/02		0.18							313
4/2/02		1.21							2107
4/3/02		0.06							104
4/4/02		0.4							697
4/5/02		0.07							122
4/6/02		0.02							35
4/8/02		0.16							279
4/9/02		0.1							174
4/10/02		0.09							157
4/11/02		0.01							17
4/12/02		0.02							35
4/13/02		0.02							35
4/14/02		1.58							2751
4/15/02		1.38							2403
4/16/02		0.78							1358
4/17/02		0							0

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Valero Reported Data</b>		Does not include pilot and purge gas							
<b>DATE</b>	<b>CAUSE/COMMENTS</b>	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	<b>District's Cal VOC (lbs)</b>
									75% HC 44 MW 98% eff
4/18/02		0.04							70
4/19/02		0.26							453
4/20/02		0.17							296
4/21/02		0.62							1080
4/22/02		0.53							923
4/23/02		0.39							679
4/24/02		0.21							366
4/25/02		0.56							975
4/26/02		0.21							366
4/27/02		0.04							70
4/28/02		0.1							174
4/29/02		0.27							470
4/30/02		0.12							209
5/1/02		0							0
5/2/02		0.12							209
5/3/02		0.01							17
5/4/02		0.01							17
5/5/02		0							0
5/6/02		0.05							87
5/7/02		0							0
5/8/02		0							0
5/9/02		0.39							679
5/10/02		0.52							906
5/11/02		0.14							244
5/12/02		0.21							366

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Valero Reported Data</b>		Does not include pilot and purge gas							
<b>DATE</b>	<b>CAUSE/COMMENTS</b>	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
5/13/02		0.37							644
5/14/02		0.05							87
5/15/02		0.65							1132
5/16/02		0.75							1306
5/17/02		1.57							2734
5/18/02		2.31							4023
5/19/02		1.54							2682
5/20/02		1.15							2003
5/21/02		0.4							697
5/22/02		0.79							1376
5/23/02		0.03							52
5/24/02		0.15							261
5/25/02		0.04							70
5/26/02		0.01							17
5/27/02		0.29							505
5/28/02		0							0
5/29/02		0							0
5/30/02		0.07							122
5/31/02		2.13							3709
<b>VALERO REPORTED FLARING SINCE JUNE, 02</b>									
6/1/02		0	1649	28	1.2	40			0
6/2/02		0	1649	28	1.2	40			0
6/3/02	Partial recovery from power failure	4.4	1454	28.6	0.8	30.5		5845	80000*
6/4/02	Recovering from power failure	5.8	1454	28.6	1.5	30.5		14052	10100

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
6/5/02	Recovering from power failure	2.9	848	25.9	0.4	12.1		1954	5050
6/6/02	Partial recovery from power failure	5.3	1391	27.8	1.1	35.6		9655	9230
6/7/02	Recovering from power failure	11.1	1391	27.8	1.5	35.6		27779	19330
6/8/02	Recovering from power failure	7.3	1766	35.5	1.3	17.5		15892	12712
6/9/02	Recovering from power failure	3.8	1766	35.5	1.3	17.5		8239	6617
6/10/02	Recovering from power failure	1	1199	27.9	0.4	20.5		691	1741
6/11/02		0.1	818	22.4	0.4	35.8			174
6/12/02		0	729	17.5	1.1	47.9			0
6/13/02		0	782	15.4	1.9	56.9			0
6/14/02		0	951	20.3	1.1	44.5			0
6/15/02		0.1	251	10.3	0	68.5			174
6/16/02		0.1	212	12.9	0	59.7			174
6/17/02		0.2	977	18.4	1.8	52.9			348
6/18/02		0.2	779	15.9	1.9	55.8			348
6/19/02		0.1	1297	23.8	1	34.8			174
6/20/02		0.1	989	18.8	1.2	52.9			174
6/21/02		0.1	863	17.7	1	46.2			174
6/22/02		0.3	939	18.9	1.4	45.1			522
6/23/02	DHFU N2 cooldown. Shut down flare gas compressor.	7.4	958	29.1	0.5	20.6		6207	12887
6/24/02	DHFU N2 cooldown. Shut down flare gas compressor.	3.7	1885	37.8	1.7	18.1		10681	6443
6/25/02		1	1196	20.8	0.7	31.5			1741
6/26/02		0.5	889	17.6	0.9	38.7			871
6/27/02		0.3	1040	18.7	0.4	38.8			522

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
6/28/02		0.4	950	17.4	1.2	39.4			697
6/29/02		0.1	948	15.8	1	45.3			174
6/30/02		0.7	210	23	0	23.4			1219
7/1/02	Cat Feed Hydrofiner (CFHU) startup	1.5	1032	21.3	0.7	31.9	19	1777	2612
7/2/02	CFHU startup	1.7	797	15.3	0.4	45.3	13	1120	2960
7/3/02		0.6	730	14.8	0.6	49.4	14		1045
7/4/02		0.7	1273	24	0.6	32.3	12		1219
7/5/02		0.1	928	16.6	1.7	56.9	12		174
7/6/02		0.1	759	15.6	0.9	56.7	14		174
7/7/02		0	885	16.1	1.2	57.4	9.3		0
7/8/02		0.6	915	17.2	1.2	53.5	12		1045
7/9/02		0.1	1110	20.3	1.5	51.9	10		174
7/10/02		0.1	1033	17.6	1.3	59.2	6.8		174
7/11/02		0.1	1064	17	1.4	59.9	6.1		174
7/12/02		0.7	1137	19.2	1.9	53.7	5.1		1219
7/13/02	CFHU unsch. Compressor shutdown	1	1137	19.2	1.9	53.7	5.1	3302	1741
7/14/02		0.2	1137	19.2	1.9	53.7	5.1		348
7/15/02		0.2	1108	20.1	1.3	52.3	7.3		348
7/16/02		0.3	1108	20.1	1.3	52.3	7.3		522
7/17/02		0.2	1824	37.8	3	0	20		348
7/18/02		0.2	827	16.3	1.1	56.6	13		348
7/19/02		1.2	1087	20	1.3	51.5	9.1	2654	2090
7/20/02		0.8	1136	24.8	1	36.1	22		1393
7/21/02		0.7	910	23.2	0.8	39.3	30		1219

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
7/22/02		0.6	1134	22.5	1.2	47.7	14		1045
7/23/02	Hot weather fuel gas containment	2	1268	22.8	0.5	48.9	6.1	1641	3483
7/24/02		0.8	1041	25.7	0.7	34.6	29		1393
7/25/02		1	1157	21.4	1.4	51.9	8.7		1741
7/26/02	Hydrocracker startup	2	1478	26.9	1.5	42.5	8.3	4979	3483
7/27/02		0.7	1663	29.1	0.8	31.4	5.2		1219
7/28/02		0.7	1663	29.1	0.8	31.4	5.2		1219
7/29/02		0.4	986	26.6	0.6	26.9	29		697
7/30/02		0.1	1417	25.4	1.1	40.9	8		174
7/31/02		0.2	1321	26.8	1.3	33.6	16		348
8/1/02		0.4	1220	23.2	0.2	44.6	10		697
8/2/02		1	1482	26.1	0.1	42.9	2.2		1741
8/3/02		0.1	1604	28.2	1.2	40.1	2.4		174
8/4/02		0.6	1282	23.4	0.6	45.6	7.4		1045
8/5/02		0.5	1219	22.4	1.3	46.7	8.3		871
8/6/02		0.4	1443	26.4	0.3	41.5	5.1		697
8/7/02		0.1	1136	23.3	0.9	35.9	13		174
8/8/02		0.4	1049	25.5	0.6	24.9	22		697
8/9/02		1	1120	21.4	1.4	45.4	10		1741
8/10/02		0.5	1204	22.7	1.1	44.7	9.7		871
8/11/02		0.5	1219	23.2	1.2	43.5	10		871
8/12/02		0.2	1187	22	1.4	46.7	8.6		348
8/13/02		0.4	1352	24.2	1.1	40.4	6.8		697
8/14/02		0.2	1338	24.4	1.3	39.7	7.3		348
8/15/02		0.4	1446	26.2	1.2	35.5	8.6		697

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff
8/16/02		0.2	1077	20	1.6	48.2	8.4		348
8/17/02	Build-up of non-condensibles in ALKY refrigeration system	1.2	1274	23.9	1	41.6	8.8	2187	2090
8/18/02		0.5	1274	23.9	1	41.6	8.8		871
8/19/02		0	1274	23.9	1	41.6	8.8		0
8/20/02		0.2	1274	23.9	1	41.6	8.8		348
8/21/02		0.1	1274	23.9	1	41.6	8.8		174
8/22/02		0.1	1274	23.9	1	41.6	8.8		174
8/23/02		0	1274	23.9	1	41.6	8.8		0
8/24/02		0.1	1274	23.9	1	41.6	8.8		174
8/25/02		0.1	1274	23.9	1	41.6	8.8		174
8/26/02		0.1	1274	23.9	1	41.6	8.8		174
8/27/02		0	1274	23.9	1	41.6	8.8		0
8/28/02		0	1274	23.9	1	41.6	8.8		0
8/29/02		0.2	1274	23.9	1	41.6	8.8		348
8/30/02		0	1274	23.9	1	41.6	8.8		0
8/31/02		0	1274	23.9	1	41.6	8.8		0

Notes: Data supplied by Valero except for last column which is the District's emission estimate based on information supplied by Valero  
 Purge and pilot flows are not always included above  
 Average based on reported values  
 Average daily value for reported data is 2 tons Includes pilot and purge gas  
 Maximum reported value (6/3/02) is 40 tons

\* District calculation for 6/3/02 for 90% efficiency, 96 MW, 3hr flow at 28 MMSCFD

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Valero Reported Data		Does not include pilot and purge gas							
DATE	CAUSE/COMMENTS	MMSCF	BTU/SCF	Mol. Wt.	H2S	H2	N2	SO2	District's Cal VOC (lbs)
									75% HC 44 MW 98% eff

### C. Phillips 66

SOURCE	RELEASE DATE & TIME	CAUSE/COMMENTS	Does not include pilot and purge gas			District's VOC Estimate	
			Reported by Plant		SOX		
			TO FLARE				
RELEASE DATE & TIME	CAUSE/COMMENTS		VOLUME (MMSCFD)	HC (lbs)	SOX (lbs)	75% HC 44 MW 98% eff	
1/19/01	Unit 110 upset H2		0.86	442	442	1498	
3/15/01	MP-30 S/D		3.41	4738	4738	5938	
3/16/01	MP-30/U200 S/D		0.95	584	584	1654	
4/4/01	U110 H2		1.47	1469	1469	2560	
6/2/01	MP-30 S/U		1.92	2220	2220	3344	
6/22/01	U110 S/U H2		1.40	1350	1350	2438	
6/23/01	U110 S/U H2		0.90	507	507	1567	
6/24/01	U240 S/D valve leak		12.83	20592	20592	22342	
6/25/01	U240 S/U		1.43	1404	1404	2490	
7/17/01	U110 S/D H2		2.06	2451	2451	3587	
7/18/01	U110 S/U H2		1.82	2062	2062	3169	
7/21/01	U240		2.15	2619	2619	3744	
7/30/01	U240 H2 leak		3.30	4543	4543	5747	
8/27/01	U240		1.91	2205	2205	3326	
9/7/01	U200		0.99	653	653	1724	
9/26/01	U110		2.69	3523	3523	4684	
11/13/01	U110		2.65	3445	3445	4615	
11/15/01	U110		2.31	2882	2882	4023	
11/26/01	U110		2.29	2853	2853	3988	
S#397 Flare	1/4/02	1300 G503 compressor down on low oil pressure alarm	1.20	674	674	2090	
S#297 Flare	1/15/02	923 Loss of compressor @ Unit 110	1.01	354	354	1759	

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Phillips 66	RELEASE DATE & TIME	CAUSE/COMMENTS	Does not include pilot and purge gas			District's VOC Estimate	
			Reported by Plant		SOX		
			TO FLARE				
SOURCE	RELEASE DATE & TIME	CAUSE/COMMENTS	VOLUME (MMSCFD)	HC (lbs)	(lbs)	75% HC 44 MW 98% eff	
	1/20/02	High liquid alarm	0.92		206	1602	
	2/4/02	High liquid alarm	0.88		130	1532	
	2/5/02	Hydrogen Plant S/D	2.26		2456	3936	
	2/6/02	Excess pressure in fuel gas system	0.87		120	1515	
	2/9/02	Pumping hydrogen heater w/N2	2.23		2401	3883	
	2/12/02	Fuel gas system overpressured	0.83		53	1445	
	2/18/02	Hydrogen plant S/U	1.13		553	1968	
	3/13/02 2200	Circulate gas compressor:PRV leaking in blowdown	1.17		618	2037	
	3/14/02	PRV leaking in blowdow	4.44		6122	7732	
	4/5/02	U240 Unicracker S/D	14.70		23417	25599	
	4/6/02		10.55		16422	18372	
	4/7/02		6.28		9228	10936	
	4/8/02		5.65		8166	9839	
	4/9/02 830-1200	Flare gas compressor out-of-service for maintenance	9.66		14918	16822	
	4/10/02		3.50		4546	6095	
	4/11/02	U240 S/D complete	3.70		4880	6443	
	4/12/02		2.43		2748	4232	
	4/13/02		3.69		4859	6426	
	4/14/02		3.31		4236	5764	
	4/15/02		2.51		2878	4371	
	4/16/02		2.52		2890	4388	

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Phillips 66	RELEASE DATE & TIME	CAUSE/COMMENTS	Does not include pilot and purge gas		District's SOX	VOC Estimate 75% HC 44 MW 98% eff		
			Reported by Plant					
			TO FLARE					
SOURCE	RELEASE DATE & TIME	CAUSE/COMMENTS	VOLUME (MMSCFD)	HC (lbs)	(lbs)	(lbs)		
	4/17/02		3.62		4754	6304		
	4/18/02		4.61		6415	8028		
	4/19/02		5.79		8401	10083		
	4/20/02		4.61		6410	8028		
	4/21/02		2.34		2596	4075		
	4/22/02		4.21		5752	7331		
	4/23/02	Flare compressor in service	3.42		4417	5956		
	4/24/02	Purging fuel gas out of balance	2.93		72	5102		
	4/25/02	Using 200 ppm TRS sweet fuel gas flaring	3.31		85	5764		
	4/26/02	"	3.47		90	6043		
	4/27/02	"	2.93		72	5102		
	4/28/02	"	2.05		42	3570		
	4/29/02	"	2.81		68	4893		
	4/30/02	"	3.47		90	6043		
	5/1/02	Stopped fuel gas	1.40		1004	2438		
	5/5/02	U110 S/U	3.65		4801	6356		
	5/6/02	U110 S/U	2.16		2295	3761		
	5/7/02	Flare compressor valve failed	2.34		2589	4075		
	5/8/02		4.19		5707	7297		
	5/9/02	Flare compressor back in service	1.32		883	2299		
	5/10/02	U240 S/D	13.75		21815	23945		
	5/11/02	U240 S/U	9.83		15202	17118		

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Phillips 66	RELEASE DATE & TIME	CAUSE/COMMENTS	Does not include pilot and purge gas		District's SOX	VOC Estimate 75% HC 44 MW 98% eff		
			Reported by Plant					
			TO FLARE					
SOURCE	RELEASE DATE & TIME	CAUSE/COMMENTS	VOLUME (MMSCFD)	HC (lbs)	(lbs)	(lbs)		
	5/12/02		4.12		5595	7175		
	5/13/02		4.35		5974	7575		
	5/14/02		4.93		6957	8585		
	5/15/02		6.55		9684	11406		
	5/16/02	S/U complete	7.88		11919	13722		
	5/24/02	MP-30 S/D	1.31		867	2281		
	5/27/02	U244 S/U	1.33		897	2316		
	5/28/02	Complete	2.54		2927	4423		
	6/10/02	U240 S/D	0.90		165	1567		
	6/11/02	U240 S/U	3.06		3810	5329		
	6/12/02		14.12		22428	24589		
	6/13/02	UK complete	13.90		22069	24206		
	6/18/02	U228 S/D	1.32		876	2299		
	6/19/02		0.76			1323		
	7/1/02	Duration (hrs) below	0.87	36818	1	1515		
	7/2/02	U240 SD	3.23	136477	3	5625		
	7/3/02	4.17 Unicracker SU	1.70	71747	1	2960		
	7/4/02	3.00 Circulating compressor due to high flow/low gravity	1.51	63862	1	2630		
	7/5/02		0.74	31102	1	1289		
	7/6/02		0.83	35071	1	1445		
	7/7/02		0.80	33744	1	1393		
	7/8/02		0.83	34916	1	1445		
	7/9/02		0.84	25299	1	1463		

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Phillips 66	RELEASE DATE & TIME	CAUSE/COMMENTS	Does not include pilot and purge gas			District's VOC Estimate	
			Reported by Plant		SOX		
			TO FLARE				
SOURCE	RELEASE DATE & TIME	CAUSE/COMMENTS	VOLUME (MMSCFD)	HC (lbs)	(lbs)	75% HC 44 MW 98% eff	
	7/10/02	4.17 Steam system failure				268000*	
	7/11/02	12.50 Steam system failure				10000**	
	7/12/02	U 240 hydrogen plant SU	1.12	47357	1	1950	
	7/13/02	SU	1.19	50377	1	2072	
	7/14/02		1.47	61854	1	2560	
	7/15/02		0.97	40941	1	1689	
	7/16/02	22.25 SU, fire on exchanger	1.38	58333	1	2403	
	7/17/02	12.42 SU, fire on exchanger	1.26	52243	1	2194	
	7/18/02		1.14	48001	1	1985	
	7/19/02		1.13	47498	1	1968	
	7/20/02		1.00	42010	1	1741	
	7/21/02		1.02	43193	1	1776	
	7/22/02		1.02	43007	1	1776	
	7/23/02		0.96	40437	1	1672	
	7/24/02	U288 SU	0.96	40597	1	1672	
	7/25/02		1.01	42841	1	1759	
	7/26/02		1.13	47585	1	1968	
	7/27/02		0.99	41817	1	1724	
	7/28/02	Increased purge due to high winds		1.03	43317	1	1794
	7/29/02			1.03	43587	1	1794
	7/30/02	Increased purge due to low tip temperature		1.03	43343	1	1794
	7/31/02			1.04	43949	1	1811

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Phillips 66	RELEASE DATE & TIME	CAUSE/COMMENTS	Does not include pilot and purge gas			District's SOX	VOC Estimate 75% HC 44 MW 98% eff		
			Reported by Plant						
			TO FLARE						
SOURCE	RELEASE DATE & TIME	CAUSE/COMMENTS	VOLUME (MMSCFD)	HC (lbs)	SOX (lbs)				
	8/1/02	H2 recycle compressor SD, MP-30SD	4.64	195735	4	8080			
	8/2/02		0.99	41771	1	1724			
	8/3/02		0.97	40816	1	1689			
	8/4/02		1.01	42484	1	1759			
	8/5/02		1.06	44540	1	1846			
	8/6/02		1.18	50001	1	2055			
	8/7/02		1.23	51808	1	2142			
	8/8/02		1.65	69866	1	2873			
	8/9/02		1.49	62823	1	2595			
	8/10/02		1.50	63410	1	2612			
	8/11/02		1.40	59304	1	2438			
	8/12/02	GB-301 air compressor SD, U110 SD	3.02	127606	3	5259			
	8/13/02		1.26	53263	1	2194			
	8/14/02		1.36	57252	1	2368			
	8/15/02		1.39	58678	1	2421			
	8/16/02		1.16	48881	1	2020			
	8/17/02		1.04	43987	1	1811			
	8/18/02		1.00	42191	1	1741			
	8/19/02		1.05	44314	1	1828			
	8/20/02		0.97	40842	1	1689			
	8/21/02		1.02	42898	1	1776			

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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SOURCE	RELEASE DATE & TIME	CAUSE/COMMENTS	Does not include pilot and purge gas			District's VOC Estimate	
			Reported by Plant		SOX		
			TO FLARE				
RELEASE DATE & TIME	CAUSE/COMMENTS		VOLUME (MMSCFD)	HC (lbs)	SOX (lbs)	75% HC 44 MW 98% eff	
8/22/02			0.99	41840	1	1724	
8/23/02			0.95	39991	1	1654	
8/24/02			0.95	39898	1	1654	
8/25/02			0.93	39431	1	1620	
8/26/02			0.93	39276	1	1620	
8/27/02	Lost feed water pumps, H2 plant SD		2.14	90303	2	3727	
8/28/02			1.59	67072	1	2769	
8/29/02			1.11	46910	1	1933	
8/30/02			1.07	45077	1	1863	
8/31/02			1.03	43273	1	1794	

\*\* District estimate based on 12.5 hours 8 MMSCFD and 98% efficiency

Notes: Data supplied by Phillips except for last column which is the District's emission estimate based on information supplied by Phillips  
Purge and pilot flows are not always included above

Average daily value for reported data is 4 tons Includes Purge and Pilot Gas  
Maximum reported value (7/10/02) is 134 tons

\* District estimated for 7/10/02 based on one hour maximum capacity and 2.5 hours 90 MMSCFD and 90% efficiency

\*\* District estimate for 7/11/02 based on 12.5 hours 8 MMSCFD and 98% efficiency

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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**D. Tesoro**

	Tesoro	Does not include pilot and purge gas					District's
		Plant Reported Data					VOC Estimate
Date	CAUSE/COMMENTS	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
1/1/01		6.69					11653
1/2/01		5.33					9274
1/3/01		6.47					11269
1/4/01		4.99					8686
1/5/01		5.89					10260
1/6/01		5.13					8938
1/7/01		5.75					10019
1/8/01		5.25					9139
1/9/01		5.00					8699
1/10/01		5.48					9547
1/11/01		5.03					8757
1/12/01		5.23					9110
1/13/01		5.51					9602
1/14/01		6.83					11892
1/15/01		4.89					8513
1/16/01		5.12					8910
1/17/01		4.90					8525
1/18/01		4.75					8271
1/19/01		5.96					10371
1/20/01		4.41					7673

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
1/21/01		7.27					12664
1/22/01		7.22					12565
1/23/01		6.36					11084
1/24/01		7.49					13036
1/25/01		4.26					7415
1/26/01		4.91					8542
1/27/01		4.78					8330
1/28/01		5.41					9429
1/29/01		4.74					8249
1/30/01		5.81					10117
1/31/01		5.37					9354
2/1/01		4.26					7418
2/2/01		4.74					8251
2/3/01		5.30					9223
2/4/01		6.18					10763
2/5/01		7.09					12353
2/6/01		7.91					13769
2/7/01		7.79					13570
2/8/01		7.55					13153
2/9/01		6.67					11618
2/10/01		7.98					13899
2/11/01		26.33					45857
2/12/01		7.95					13846

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
2/13/01		9.99					17393
2/14/01		12.86					22402
2/15/01		13.18					22953
2/16/01		9.51					16564
2/17/01		6.20					10789
2/18/01		6.20					10790
2/19/01		5.91					10294
2/20/01		6.21					10823
2/21/01		6.34					11049
2/22/01		5.34					9302
2/23/01		5.64					9819
2/24/01		4.47					7787
2/25/01		5.32					9271
2/26/01		4.80					8361
2/27/01		4.99					8689
2/28/01		5.21					9070
3/1/01		4.54					7909
3/2/01		4.87					8488
3/3/01		4.43					7722
3/4/01		5.87					10227
3/5/01		5.36					9331
3/6/01		4.79					8339
3/7/01		5.50					9582

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
3/8/01		5.08					8853
3/9/01		5.01					8719
3/10/01		4.61					8032
3/11/01		5.39					9386
3/12/01		5.40					9405
3/13/01		6.31					10981
3/14/01		6.70					11662
3/15/01		6.56					11423
3/16/01		6.51					11337
3/17/01		6.58					11452
3/18/01		9.90					17244
3/19/01		8.34					14515
3/20/01		6.68					11641
3/21/01		7.92					13785
3/22/01		6.05					10528
3/23/01		6.49					11306
3/24/01		7.54					13131
3/25/01		11.27					19627
3/26/01		6.22					10827
3/27/01		6.44					11208
3/28/01		44.91					78216
3/29/01		137.89					240130
3/30/01		90.27					157198

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
<b>Date</b>	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
3/31/01		6.90					12018
4/1/01		6.37					11092
4/2/01		5.03					8752
4/3/01		5.42					9430
4/4/01		6.11					10639
4/5/01		8.35					14535
4/6/01		5.85					10195
4/7/01		5.84					10163
4/8/01		6.41					11157
4/9/01		6.82					11868
4/10/01		6.72					11703
4/11/01		7.60					13242
4/12/01		7.65					13330
4/13/01		8.36					14551
4/14/01		5.69					9905
4/15/01		6.21					10808
4/16/01		8.23					14336
4/17/01		19.41					33803
4/18/01		12.77					22245
4/19/01		9.78					17023
4/20/01		4.88					8498
4/21/01		4.10					7148
4/22/01		5.36					9342

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
4/23/01		4.99					8692
4/24/01		5.29					9220
4/25/01		6.29					10955
4/26/01		13.21					23003
4/27/01		5.73					9978
4/28/01		4.87					8475
4/29/01		5.12					8916
4/30/01		5.69					9902
5/1/2001		5.24					9120
5/2/01		5.45					9494
5/3/01		4.44					7724
5/4/01		7.19					12529
5/5/01		5.58					9717
5/6/01		9.16					15945
5/7/01		6.64					11560
5/8/01		6.54					11390
5/9/01		6.07					10569
5/10/01		5.20					9051
5/11/01		5.32					9265
5/12/01		5.28					9199
5/13/01		5.65					9839
5/14/01		4.66					8114
5/15/01		4.95					8613

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
<b>Date</b>	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
5/16/01		5.07					8827
5/17/01		4.53					7890
5/18/01		5.70					9922
5/19/01		4.97					8658
5/20/01		7.34					12783
5/21/01		8.50					14795
5/22/01		6.70					11663
5/23/01		7.25					12629
5/24/01		5.39					9379
5/25/01		5.43					9453
5/26/01		5.07					8832
5/27/01		5.09					8863
5/28/01		5.08					8850
5/29/01		5.82					10137
5/30/01		6.10					10624
5/31/01		6.97					12138
6/1/2001		5.62					9779
6/2/01		4.56					7941
6/3/01		4.81					8381
6/4/01		4.70					8185
6/5/01		4.83					8416
6/6/01		5.12					8912
6/7/01		5.96					10384

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
6/8/01		5.21					9073
6/9/01		4.90					8538
6/10/01		4.91					8546
6/11/01		4.66					8114
6/12/01		4.86					8461
6/13/01		5.57					9704
6/14/01		5.18					9027
6/15/01		5.27					9185
6/16/01		5.61					9777
6/17/01		5.62					9784
6/18/01		5.60					9759
6/19/01		5.81					10115
6/20/01		8.62					15020
6/21/01		8.28					14426
6/22/01		9.24					16088
6/23/01		6.61					11505
6/24/01		6.16					10736
6/25/01		6.01					10468
6/26/01		7.56					13167
6/27/01		6.78					11810
6/28/01		6.87					11967
6/29/01		8.57					14920
6/30/01		8.11					14124

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
<b>Date</b>	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
7/1/2001		6.62					11531
7/2/01		8.80					15327
7/3/01		8.37					14570
7/4/01		8.54					14867
7/5/01		6.88					11985
7/6/01		6.40					11144
7/7/01		6.02					10488
7/8/01		7.99					13907
7/9/01		6.83					11891
7/10/01		6.33					11020
7/11/01		9.49					16524
7/12/01		8.56					14913
7/13/01		8.25					14365
7/14/01		7.57					13182
7/15/01		6.31					10989
7/16/01		6.30					10973
7/17/01		6.50					11317
7/18/01		6.99					12178
7/19/01		7.16					12476
7/20/01		9.42					16412
7/21/01		7.69					13390
7/22/01		7.77					13537
7/23/01		7.82					13626

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
7/24/01		10.18					17736
7/25/01		5.86					10200
7/26/01		5.64					9815
7/27/01		5.91					10294
7/28/01		6.88					11988
7/29/01		7.21					12560
7/30/01		7.64					13305
7/31/01		8.53					14851
8/1/2001		8.13					14159
8/2/01		7.49					13041
8/3/01		7.83					13637
8/4/01		7.03					12236
8/5/01		6.22					10840
8/6/01		7.71					13426
8/7/01		7.79					13563
8/8/01		7.95					13851
8/9/01		6.80					11847
8/10/01		5.85					10181
8/11/01		5.97					10398
8/12/01		6.02					10482
8/13/01		5.68					9887
8/14/01		6.02					10483
8/15/01		6.27					10921

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
8/16/01		6.42					11175
8/17/01		6.05					10527
8/18/01		7.55					13143
8/19/01		5.88					10247
8/20/01		5.93					10329
8/21/01		6.05					10535
8/22/01		7.97					13881
8/23/01		6.57					11432
8/24/01		7.46					12984
8/25/01		8.69					15135
8/26/01		13.68					23827
8/27/01		11.90					20726
8/28/01		8.93					15550
8/29/01		8.22					14307
8/30/01		92.53					161129
8/31/01		128.60					223949
9/1/2001		46.32					80662
9/2/01		13.19					22969
9/3/01		9.01					15684
9/4/01		7.09					12344
9/5/01		8.55					14886
9/6/01		8.79					15302
9/7/01		8.54					14874

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
9/8/01		8.58					14940
9/9/01		8.46					14727
9/10/01		8.63					15023
9/11/01		9.07					15801
9/12/01		8.44					14702
9/13/01		8.10					14101
9/14/01		8.35					14542
9/15/01		6.96					12124
9/16/01		8.77					15268
9/17/01		14.50					25243
9/18/01		9.15					15926
9/19/01		8.01					13950
9/20/01		6.27					10914
9/21/01		6.10					10626
9/23/01		5.88					10244
9/28/01		7.01					12202
9/29/01		6.50					11322
9/30/01		8.04					14006
10/1/2001		6.95					12108
10/2/01		7.98					13901
10/3/01		7.17					12483
10/4/01		7.19					12515
10/5/01		9.41					16385

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
<b>Date</b>	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
10/6/01		6.17					10746
10/7/01		6.01					10458
10/8/01		5.29					9204
10/9/01		5.78					10060
10/10/01		6.80					11834
10/11/01		7.69					13400
10/12/01		7.75					13498
10/13/01		6.68					11633
10/14/01		6.57					11435
10/15/01		8.45					14723
10/16/01		6.25					10888
10/17/01		9.46					16481
10/18/01		5.80					10099
10/19/01		5.57					9698
10/20/01		5.12					8915
10/21/01		4.89					8520
10/22/01		5.21					9075
10/23/01		4.79					8334
10/24/01		5.17					9007
10/25/01		7.07					12317
10/26/01		5.15					8968
10/27/01		6.36					11077
10/28/01		6.60					11492

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
10/29/01		4.70					8180
10/30/01		4.94					8595
10/31/01		5.25					9140
11/1/2001		4.85					8454
11/2/01		6.85					11936
11/13/2000 1		18.24					31772
11/4/01		8.72					15180
11/5/01		8.82					15359
11/6/01		6.17					10750
11/7/01		4.57					7964
11/8/01		4.65					8099
11/9/01		4.68					8152
11/10/01		5.29					9212
11/11/01		5.53					9626
11/12/01		5.16					8990
11/13/01		6.89					11999
11/14/01		7.15					12443
11/15/01		11.74					20437
11/16/01		8.04					13998
11/17/01		8.13					14151
11/18/01		8.05					14017
11/19/01		6.33					11029

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
11/20/01		8.68					15120
11/21/01		11.03					19216
11/22/01		7.96					13858
11/23/01		4.53					7886
11/24/01		7.85					13671
11/25/01		9.21					16031
11/26/01		9.17					15964
11/27/01		7.97					13884
11/28/01		8.69					15129
11/29/01		7.79					13565
11/30/01		6.84					11904
12/1/01		7.35					12792
12/2/01		7.71					13428
12/3/01		18.63					32439
12/4/01		10.89					18972
12/5/01		9.76					16993
12/6/01		18.85					32826
12/7/01		26.94					46912
12/8/01		25.23					43942
12/9/01		22.92					39921
12/10/01		37.64					65541
12/11/01		40.72					70912
12/12/01		40.00					69651

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
<b>Date</b>	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
12/13/01		30.15					52509
12/14/01		38.83					67624
12/15/01		39.38					68583
12/16/01		43.25					75315
12/17/01		45.85					79852
12/18/01		45.55					79329
12/19/01		29.52					51399
12/20/01		39.08					68061
12/21/01		42.36					73762
12/22/01		46.75					81418
12/23/01		46.40					80808
12/24/01		40.83					71104
12/25/01		17.11					29792
12/26/01		10.42					18142
12/27/01		7.41					12908
12/28/01		30.63					53334
12/29/01		20.76					36148
12/30/01		4.95					8616
12/31/01		20.88					36360
1/1/2002		28.86					50251
1/2/02		9.18					15993
1/3/02		18.87					32865
1/4/02		38.64					67296

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
<b>Date</b>	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
1/5/02		34.43					59965
1/6/02		30.77					53579
1/7/02		19.76					34412
1/8/02		16.80					29260
1/9/02		35.67					62125
1/10/02		27.22					47397
1/11/02		27.22					47397
1/11/02		28.65					49900
1/12/02		35.64					62060
1/13/02		36.58					63704
1/14/02		38.55					67130
1/15/02		35.87					62466
1/16/02		33.11					57664
1/17/02		31.99					55708
1/18/02		30.36					52876
1/19/02		32.99					57456
1/20/02		19.91					34678
1/21/02		14.97					26065
1/22/02		21.89					38128
1/23/02		27.51					47903
1/24/02		31.34					54582
1/25/02		51.63					89916
1/26/02		51.63					89916

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
<b>Date</b>	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
1/27/02		52.61					91609
1/27/02		51.12					89014
1/28/02		48.63					84693
1/29/02		47.05					81937
1/30/02		18.12					31562
1/30/02		18.12					31562
1/30/02		18.12					31562
1/31/02		20.89					36373
2/1/2002		25.01					43553
2/2/02		33.55					58426
2/3/02		31.63					55074
2/4/02		34.85					60692
2/5/02		34.31					59741
2/6/02		41.87					72920
2/7/02		46.34					80692
2/8/02		36.00					62691
2/9/02		39.49					68766
2/10/02		37.40					65127
2/11/02		28.96					50438
2/12/02		39.05					68011
2/13/02		12.53					21816
2/14/02		34.03					59261
2/15/02		25.04					43599

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
2/16/02		30.81					53654
2/17/02		29.01					50516
2/18/02		29.43					51243
2/19/02		31.65					55122
2/20/02		43.48					75710
2/21/02		39.19					68247
2/22/02		56.13					97742
2/23/02		51.44					89587
2/24/02		47.74					83140
2/25/02		44.33					77204
2/26/02		49.23					85726
2/27/02		31.48					54816
2/28/02		34.10					59376
3/1/2002		38.78					67537
3/2/02		37.74					65723
3/3/02		48.94					85222
3/4/02		31.05					54077
3/5/02		41.44					72172
3/6/02		44.17					76923
3/7/02		37.88					65971
3/8/02		25.54					44478
3/9/02		28.10					48943
3/10/02		49.74					86621

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
<b>Date</b>	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
3/11/02		46.45					80891
3/12/02		41.73					72670
3/13/02		43.71					76117
3/14/02		41.63					72489
3/15/02		39.93					69527
3/16/02		43.15					75135
3/17/02		33.09					57616
3/18/02		39.78					69272
3/19/02		39.51					68804
3/20/02		35.12					61163
3/21/02		30.88					53781
3/22/02		35.16					61226
3/23/02		27.19					47356
3/24/02		27.44					47787
3/25/02		7.61					13246
3/26/02		20.46					35622
3/27/02		27.26					47475
3/28/02		40.65					70781
3/29/02		34.94					60849
3/30/02		15.55					27085
3/31/02		11.88					20690
4/1/02		10.90					18985
4/2/02		6.92					12057

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
4/3/02		7.03					12241
4/4/02		3.61					6295
4/5/02		15.69					27328
4/6/02		22.04					38373
4/7/02		60.46					105290
4/8/02		55.30					96309
4/9/02		45.34					78961
4/10/02		40.39					70328
4/11/02		33.54					58415
4/12/02		10.00					17408
4/13/02		13.10					22815
4/14/02		7.23					12585
4/15/02		9.77					17009
4/16/02		10.28					17911
4/17/02		6.37					11086
4/18/02		2.82					4918
4/19/02		5.56					9678
4/20/02		5.51					9592
4/21/02		11.19					19490
4/22/02		15.49					26977
4/23/02		12.92					22507
4/24/02		7.55					13154
4/25/02		8.54					14873

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
4/26/02		7.31					12725
4/27/02		6.06					10558
4/28/02		6.22					10825
4/29/02		5.51					9602
4/30/02		7.52					13093
5/1/2002		5.54					9650
5/2/02		9.86					17174
5/3/02		8.83					15372
5/4/02		21.36					37197
5/5/02		15.56					27091
5/6/02		10.81					18822
5/7/02		11.17					19450
5/8/02		11.31					19690
5/9/02		8.73					15208
5/10/02		9.90					17249
5/11/02		18.28					31837
5/12/02		10.03					17467
5/13/02		11.94					20790
5/14/02		11.94					20798
5/15/02		12.80					22293
5/16/02		10.24					17832
5/17/02		12.41					21611
5/18/02		9.24					16096

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
<b>Date</b>	<b>CAUSE/COMMENTS</b>	<b>Volume</b> (MMSCFD)	<b>HHV</b> (BTU/SCF)	<b>H2S</b> (Mole %)	<b>Mol. Wt</b> (lbs/mole)	<b>SOx</b> (lbs/day)	<b>75% HC 44 MW 98% eff</b> (lbs)
5/19/02		10.53					18332
5/20/02		11.13					19389
5/21/02		10.27					17888
5/22/02		16.83					29308
5/23/02		23.93					41679
5/24/02		25.08					43669
5/25/02		15.24					26535
5/26/02		9.88					17213
5/27/02		5.81					10122
5/28/02		5.78					10061
5/29/02		5.98					10406
5/30/02		6.65					11579
5/31/02		6.58					11462
6/1/02		5.61	839	1.68	33.11	15940	9769
6/2/02		5.72	839	1.68	33.11	16240	9961
6/3/02		6.25	839	1.68	33.11	17760	10884
6/4/02		7.28	839	1.68	33.11	20680	12678
6/5/02		7.14	839	1.68	33.11	20280	12434
6/6/02		4.78	839	1.68	33.11	13580	8324
6/7/02		5.99	839	1.68	33.11	17020	10431
6/8/02		9.21	839	1.68	33.11	21680	16039
6/9/02		11.85	839	1.68	33.11	33640	20636
6/10/02		18.48	839	1.68	33.11	5252	32182

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
6/11/02		11.35	839	1.68	33.11	32260	19765
6/12/02		7.74	839	1.68	33.11	22000	13479
6/13/02		9.65	839	1.68	33.11	27420	16805
6/14/02		5.45	839	1.68	33.11	15480	9491
6/15/02		4.85	839	1.68	33.11	13780	8446
6/16/02		4.83	839	1.68	33.11	13720	8411
6/17/02		7.9	839	1.68	33.11	15500	13757
6/18/02		4.8	839	1.68	33.11	22320	8359
6/19/02		6.1	839	1.68	33.11	13540	10623
6/20/02		5	839	1.68	33.11	17460	8707
6/21/02		7.3	839	1.68	33.11	14240	12712
6/22/02		11.5	839	1.68	33.11	20860	20026
6/23/02		7.4	839	1.68	33.11	32720	12887
6/24/02		6.7	839	1.68	33.11	21140	11668
6/25/02		5.2	839	1.68	33.11	19060	9055
6/26/02		6	839	1.68	33.11	14760	10449
6/27/02		5.3	839	1.68	33.11	17080	9230
6/28/02		5.5	839	1.68	33.11	15140	9578
6/29/02		6.6	839	1.68	33.11	15740	11493
6/30/02		7.4	839	1.68	33.11	18760	12887
7/1/02	Foul water compressor down	7.42	826	1.7	32.7	21240	12921
7/2/02		6.26	826	1.7	32.7	17920	10901

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
7/3/02		5.88	826	1.7	32.7	16840	10240
7/4/02		6.15	826	1.7	32.7	17600	10710
7/5/02		6.97	826	1.7	32.7	19960	12138
7/6/02		6.17	826	1.7	32.7	17640	10745
7/7/02		5.8	826	1.7	32.7	16580	10100
7/8/02		6.38	826	1.7	32.7	18280	11110
7/9/02		7.82	826	1.7	32.7	22400	13618
7/10/02	#2 H2 Plant PSA vent to flare	8.6	826	1.7	32.7	24620	14976
7/11/02		7.02	826	1.7	32.7	20080	12225
7/12/02		6.92	826	1.7	32.7	19800	12051
7/13/02		6.98	826	1.7	32.7	19980	12155
7/14/02		6.09	826	1.7	32.7	17440	10605
7/15/02		6.39	826	1.7	32.7	18280	11128
7/16/02		6.15	826	1.7	32.7	17620	10710
7/17/02		5.95	826	1.7	32.7	17020	10361
7/18/02	#3 Crude furnace tripped off, #3 HDS Stripper was bypassed to fix leak (see note 1)	9.55	826	0.05	32.7	800	16631
7/19/02		7.03	826	1.7	32.7	20120	12242
7/20/02		5.65	826	1.7	32.7	16180	9839
7/21/02		4.92	826	1.7	32.7	14080	8568
7/22/02		4.53	826	1.7	32.7	12980	7889

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
<b>Date</b>	<b>CAUSE/COMMENTS</b>	<b>Volume</b> (MMSCFD)	<b>HHV</b> (BTU/SCF)	<b>H2S</b> (Mole %)	<b>Mol. Wt</b> (lbs/mole)	<b>SOx</b> (lbs/day)	<b>75% HC 44 MW 98% eff</b>
7/23/02		4.37	826	1.7	32.7	12520	7610
7/24/02		5.23	826	1.7	32.7	14960	9108
7/25/02		7.27	826	1.7	32.7	20800	12660
7/26/02	Lost lean DEA pump, flared fule gas (see note 2)	12.59	1092	3.5	32.7	49240	21925
7/27/02	Adjusting unit rates after upset	8.8	826	1.7	32.7	25180	15325
7/28/02	#2 H2 Plant shutdown	6.1	826	1.7	32.7	17480	10623
7/29/02	Units are cut back due to H2 shortage	3.97	826	1.7	32.7	11360	6913
7/30/02		3.95	826	1.7	32.7	11320	6879
7/31/02		3.27	826	1.7	32.7	9380	5694
8/1/02		3.3	802.89	1.51	32.41	8420	5747
8/2/02		7.3	802.89	1.51	32.41	18580	12712
8/3/02		7.8	802.89	1.51	32.41	19940	13583
8/4/02		6.1	802.89	1.51	32.41	15580	10623
8/5/02	H2 Plant shutdown 13 hours	16.1	802.89	1.51	32.41	19580	28037
8/6/02		6.1	802.89	1.51	32.41	15620	10623
8/7/02		4.8	802.89	1.51	32.41	15520	8359
8/8/02		7.2	802.89	1.51	32.41	12300	12538
8/9/02		5.3	802.89	1.51	32.41	18380	9230
8/10/02		5.1	802.89	1.51	32.41	13580	8881

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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	<b>Tesoro</b>	Does not include pilot and purge gas					<b>District's</b>
		<b>Plant Reported Data</b>					<b>VOC Estimate</b>
Date	<b>CAUSE/COMMENTS</b>	Volume (MMSCFD)	HHV (BTU/SCF)	H2S (Mole %)	Mol. Wt (lbs/mole)	SOx (lbs/day)	75% HC 44 MW 98% eff (lbs)
8/11/02		7.8	802.89	1.51	32.41	12960	13583
8/12/02		5.4	802.89	1.51	32.41	19780	9404
8/13/02		4.8	802.89	1.51	32.41	13720	8359
8/14/02		6	802.89	1.51	32.41	12080	10449
8/15/02		6.3	802.89	1.51	32.41	15260	10971
8/16/02		6.4	802.89	1.51	32.41	16300	11145
8/17/02	Previous 30 days average	6.4	802.89	1.51	32.41	16300	11145
8/18/02	We had problems with data collection on July 17-28 and 31	6.4	802.89	1.51	32.41	16300	11145
8/19/02		6.4	802.89	1.51	32.41	16300	11145
8/20/02		6.4	802.89	1.51	32.41	16300	11145
8/21/02		6.4	802.89	1.51	32.41	16300	11145
8/22/02		6.4	802.89	1.51	32.41	16300	11145
8/23/02		6.4	802.89	1.51	32.41	16300	11145
8/24/02		6.4	802.89	1.51	32.41	16300	11145
8/25/02		6.4	802.89	1.51	32.41	16300	11145
8/26/02		6.4	802.89	1.51	32.41	16300	11145
8/27/02		6.4	802.89	1.51	32.41	16300	11145
8/28/02		6.4	802.89	1.51	32.41	16300	11145
8/29/02		6.2	802.89	1.51	32.41	15700	10797
8/30/02		6.4	802.89	1.51	32.41	16300	11145
8/31/02		6.4	802.89	1.51	32.41	16300	11145

***DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES***

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Notes: Data supplied by Tesoro except for last column which is the District's emission estimate based on information supplied by Tesoro

Purge and pilot flows are not always included above

Average based on reported values

Average daily value for reported data is

13 tons

Pilot and purge gas included

Maximum reported value (3/29/01) is

120 tons

## E. Shell

<b>Shell Reported Data for All Flares Except Flexigas</b>		
<b>Shell's Reported Data Listed on a Daily Basis</b>		
Pilot and purge gas are not included		
		<b>District's</b>
		<b>Cal VOC</b>
		lbs
<b>Date</b>	<b>Flow - MMSCFD</b>	75% HC 44 MW 98% eff
1/5/01	0.06	97
1/16/01	1.40	2444
1/18/01	0.02	29
1/24/01	0.01	10
1/25/01	0.02	33
1/27/01	0.07	119
1/28/01	0.00	3
1/29/01	0.02	32
1/30/01	0.06	99
2/1/01	0.18	307
2/3/01	0.17	300
2/4/01	0.03	48
2/15/01	0.03	44
2/17/01	0.04	75
2/21/01	0.23	400
2/23/01	0.02	29
2/27/01	0.48	838
3/12/01	0.04	62

<b>Shell Reported Data for All Flares Except Flexigas</b>		
<b>Shell's Reported Data Listed on a Daily Basis</b>		
Pilot and purge gas are not included		
	<b>District's</b>	
	<b>Cal VOC</b>	
	lbs	
		75% HC 44 MW 98% eff
Date	Flow - MMSCFD	
3/13/01	0.01	23
3/19/01	0.24	419
3/25/01	0.53	923
3/26/01	0.10	176
3/27/01	0.02	29
4/2/01	0.02	31
4/8/01	0.05	96
4/9/01	0.29	507
4/10/01	0.05	81
4/11/01	0.33	568
4/12/01	0.17	295
4/18/01	0.22	376
4/21/01	0.31	541
4/27/01	0.00	0
5/1/01	0.00	7
6/2/01	0.13	219
6/12/01	0.01	16
6/13/01	0.03	47
6/16/01	0.17	290
6/26/01	0.02	36
6/27/01	0.00	7

<b>Shell Reported Data for All Flares Except Flexigas</b>		
<b>Shell's Reported Data Listed on a Daily Basis</b>		
Pilot and purge gas are not included		
		<b>District's</b>
		<b>Cal VOC</b>
		lbs
		75% HC 44 MW 98% eff
Date	Flow - MMSCFD	
7/9/01	0.27	475
7/11/01	0.06	109
7/13/01	0.08	145
7/17/01	0.12	205
8/9/01	0.28	484
8/10/01	0.10	176
8/17/01	0.02	30
8/19/01	0.02	36
8/22/01	0.08	131
8/29/01	0.01	18
9/1/01	0.01	26
9/2/01	0.01	26
9/3/01	0.12	216
9/4/01	0.11	198
9/5/01	0.01	26
9/6/01	0.02	40
9/7/01	0.01	26
9/8/01	0.01	26
9/9/01	0.01	26
9/10/01	0.01	26
9/11/01	0.01	26

<b>Shell Reported Data for All Flares Except Flexigas</b>		
<b>Shell's Reported Data Listed on a Daily Basis</b>		
Pilot and purge gas are not included		
	<b>District's</b>	
	<b>Cal VOC</b>	
		<b>lbs</b>
<b>Date</b>	<b>Flow - MMSCFD</b>	<b>75% HC 44 MW 98% eff</b>
9/12/01	0.01	26
9/13/01	0.03	45
9/14/01	0.01	26
9/15/01	0.01	26
9/16/01	0.01	26
9/17/01	0.01	26
9/18/01	0.04	62
9/19/01	0.01	26
9/20/01	0.01	26
9/21/01	0.01	26
9/22/01	0.01	26
9/23/01	0.04	72
9/24/01	0.01	26
9/25/01	0.49	858
9/26/01	0.01	26
9/27/01	0.01	26
9/28/01	0.01	26
9/29/01	0.01	26
9/30/01	0.01	26
10/1/01	0.05	80
10/2/01	0.01	26

<b>Shell Reported Data for All Flares Except Flexigas</b>		
<b>Shell's Reported Data Listed on a Daily Basis</b>		
Pilot and purge gas are not included		
	<b>District's</b>	
	<b>Cal VOC</b>	
		<b>lbs</b>
		75% HC 44 MW 98% eff
Date	Flow - MMSCFD	
10/3/01	0.01	26
10/4/01	0.01	26
10/5/01	0.01	26
10/6/01	0.01	26
10/7/01	0.01	26
10/8/01	0.01	26
10/9/01	0.01	26
10/10/01	0.01	26
10/11/01	0.01	26
10/12/01	0.12	217
10/13/01	0.01	26
10/14/01	0.01	26
10/15/01	0.01	26
10/16/01	0.07	126
10/17/01	0.01	26
10/18/01	0.01	26
10/19/01	0.01	26
10/20/01	0.01	26
10/21/01	0.01	26
10/22/01	0.01	26
10/23/01	0.01	26

<b>Shell Reported Data for All Flares Except Flexigas</b>		
<b>Shell's Reported Data Listed on a Daily Basis</b>		
Pilot and purge gas are not included		
	<b>District's</b>	
	<b>Cal VOC</b>	
		<b>lbs</b>
<b>Date</b>	<b>Flow - MMSCFD</b>	75% HC 44 MW 98% eff
10/24/01	0.01	26
10/25/01	0.01	26
10/26/01	0.08	135
10/27/01	0.01	26
10/28/01	0.08	144
10/29/01	0.05	84
10/30/01	0.01	26
10/31/01	0.01	26
11/1/01	0.01	26
11/2/01	0.01	26
11/3/01	0.01	26
11/4/01	0.01	26
11/5/01	0.04	62
11/6/01	0.01	26
11/7/01	0.01	26
11/8/01	0.01	26
11/9/01	0.01	26
11/10/01	0.01	26
11/11/01	0.01	26
11/12/01	0.01	26
11/13/01	0.01	26

<b>Shell Reported Data for All Flares Except Flexigas</b>		
<b>Shell's Reported Data Listed on a Daily Basis</b>		
Pilot and purge gas are not included		
	<b>District's</b>	
	<b>Cal VOC</b>	
		<b>lbs</b>
		75% HC 44 MW 98% eff
Date	Flow - MMSCFD	
11/14/01	0.01	26
11/15/01	0.02	38
11/16/01	0.01	26
11/17/01	0.01	26
11/18/01	0.01	26
11/19/01	0.04	76
11/20/01	0.01	26
11/21/01	0.01	26
11/22/01	0.01	26
11/23/01	0.01	26
11/24/01	0.01	26
11/25/01	0.01	26
11/26/01	0.01	26
11/27/01	0.01	26
11/28/01	0.02	42
11/29/01	0.02	42
11/30/01	0.01	26
12/1/01	0.01	26
12/2/01	0.01	26
12/3/01	0.01	26
12/4/01	0.03	48

<b>Shell Reported Data for All Flares Except Flexigas</b>		
<b>Shell's Reported Data Listed on a Daily Basis</b>		
Pilot and purge gas are not included		
	<b>District's</b>	
	<b>Cal VOC</b>	
		<b>lbs</b>
		75% HC 44 MW 98% eff
Date	Flow - MMSCFD	
12/5/01	0.01	26
12/6/01	0.01	26
12/7/01	0.01	26
12/8/01	0.01	26
12/9/01	0.01	26
12/10/01	0.01	26
12/11/01	0.01	26
12/12/01	0.01	26
12/13/01	0.01	26
12/14/01	0.32	564
12/15/01	0.13	231
12/16/01	0.01	26
12/17/01	0.01	26
12/18/01	0.01	26
12/19/01	0.01	26
12/20/01	0.49	859
12/21/01	0.06	107
12/22/01	0.03	55
12/23/01	0.01	26
12/24/01	0.01	26
12/25/01	0.01	26

<b>Shell Reported Data for All Flares Except Flexigas</b>		
<b>Shell's Reported Data Listed on a Daily Basis</b>		
Pilot and purge gas are not included		
	<b>District's</b>	
	<b>Cal VOC</b>	
		<b>lbs</b>
		75% HC 44 MW 98% eff
Date	Flow - MMSCFD	
12/26/01	0.07	129
12/27/01	0.01	26
12/28/01	0.01	26
12/29/01	0.01	26
12/30/01	0.01	26
12/31/01	0.71	1241
1/1/02	0.01	26
1/2/02	0.01	26
1/3/02	0.19	323
1/4/02	0.01	26
1/5/02	0.01	26
1/6/02	0.01	26
1/7/02	0.01	26
1/8/02	0.01	26
1/9/02	0.01	26
1/10/02	0.01	26
1/11/02	0.01	26
1/12/02	0.01	26
1/13/02	0.12	217
1/14/02	1.59	2774
1/15/02	0.02	36

<b>Shell Reported Data for All Flares Except Flexigas</b>		
<b>Shell's Reported Data Listed on a Daily Basis</b>		
Pilot and purge gas are not included		
	<b>District's</b>	
	<b>Cal VOC</b>	
		<b>lbs</b>
		75% HC 44 MW 98% eff
Date	Flow - MMSCFD	
1/16/02	0.01	26
1/17/02	0.06	101
1/18/02	0.10	171
1/19/02	0.08	135
1/20/02	0.01	26
1/21/02	0.09	161
1/22/02	0.01	26
1/23/02	0.03	59
1/24/02	0.03	59
1/25/02	0.06	104
1/26/02	0.03	59
1/27/02	0.01	26
1/28/02	0.03	59
1/29/02	0.05	80
2/24/02	0.02	27
2/26/02	0.01	16
3/22/02	0.81	1403
3/23/02	0.19	327
4/3/02	0.02	29
4/9/02	1.03	1789
4/13/02	0.07	118

<b>Shell Reported Data for All Flares Except Flexigas</b>		
<b>Shell's Reported Data Listed on a Daily Basis</b>		
Pilot and purge gas are not included		
	<b>District's</b>	
	<b>Cal VOC</b>	
	lbs	
<b>Date</b>	<b>Flow - MMSCFD</b>	<b>75% HC 44 MW 98% eff</b>
5/11/02	0.02	33
5/19/02	0.03	55
5/20/02	0.11	194
5/21/02	0.24	420
5/22/02	0.03	48
5/23/02	0.05	87
6/4/02	1.22	2127
6/5/02	0.56	980
6/22/02	0.03	52
6/23/02	0.12	201
6/24/02	0.17	294
6/25/02	0.02	27
6/26/02	0.07	124
6/27/02	0.04	73
7/9/02	0.20	348
7/19/02	1.40	2438
7/25/02	0.03	52
7/29/02	0.00	1
8/2/02	2.50	4354
8/3/02	0.20	350
8/12/02	1.60	2786

<b>Shell Reported Data for All Flares Except Flexigas</b>		
<b>Shell's Reported Data Listed on a Daily Basis</b>		
Pilot and purge gas are not included		
		<b>District's</b>
		<b>Cal VOC</b>
		lbs
<b>Date</b>	<b>Flow - MMSCFD</b>	75% HC 44 MW 98% eff
8/13/02	0.02	35
8/14/02	0.01	21
8/21/02	0.21	361
8/22/02	0.03	49
10/27/02	0.01	16

**Notes:** Data supplied by Shell. Emissions calculated by the District.

For other than the Flexigas flare:

Average daily value for reported data is

**1 ton**

Above includes pilot and purge gases

Maximum reported value (8/2/02) is

**2 Tons**

<b>Following is actual data reported by Shell</b>					
Pilot and purge gas need to be added					
<b>LOP</b>					
<b>Date/Time</b>	<b>Estimated Flow</b>				
	<b>(MMSCF)</b>				
01/16/2001 7:24	0.0104167			Shell's reported data	
2/1/2001 7:25	0.0472222			Shell's reported data	
2/1/2001 8:47	0.0055556			Shell's reported data	

<b>Following is actual data reported by Shell</b>					
Pilot and purge gas need to be added					
<b>LOP</b>					
Date/Time	Estimated Flow				
	(MMSCF)				
2/1/2001 10:29	0.1027778				Shell's reported data
02/17/2001 5:20	0.043				Shell's reported data
02/27/2001 0:00	0.481				Shell's reported data
03/13/2001 15:37	0.0134722				Shell's reported data
03/26/2001 19:10	0.10125				Shell's reported data
03/27/2001 15:35	0.0166667				Shell's reported data
04/08/2001 23:48	0.0548611				Shell's reported data
04/10/2001 15:40	0.0465972				Shell's reported data
04/11/2001 1:00	0.3261806				Shell's reported data
04/12/2001 14:55	0.1694444				Shell's reported data
5/1/2001 23:20	0.0041667				Shell's reported data
6/1/2001 9:39	0.0037				Shell's reported data
6/1/2001 23:07	0.0057				Shell's reported data
06/02/2001 7:21	0.126				Shell's reported data
06/13/2001 3:50	0.0269444				Shell's reported data
06/16/2001 8:04	0.1666667				Shell's reported data
06/26/2001 6:38	0.0208333				Shell's reported data
06/27/2001 5:27	0.0041667				Shell's reported data
07/09/2001 0:00	0.273				Shell's reported data
07/11/2001 5:58	0.0625				Shell's reported data
07/13/2001 5:28	0.0833333				Shell's reported data
07/17/2001 0:00	0.0013				Shell's reported data
08/09/2001 0:40	0.278				Shell's reported data
08/09/2001 1:49					Shell's reported data
08/10/2001 16:37	0.10125				Shell's reported data

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Following is actual data reported by Shell</b>					
Pilot and purge gas need to be added					
<b>LOP</b>					
Date/Time	<b>Estimated Flow</b>				
	(MMSCF)				
08/19/2001 3:14	0.0104167				
08/19/2001 3:14	0.0104167				
08/22/2001 0:00	0.011				
8/29/2001 6:32,	0.0104167				
09/03/2001 11:31	0.0777778				
09/03/2001 11:57	0.0208333				
09/03/2001 21:56	0.0104167				
09/13/2001 1:03	0				
09/13/2001 14:31	0.0055556				
09/13/2001 14:47	0.0055556				
09/18/2001 1:50	0.0208333				
09/23/2001 21:39	0.0264				
09/25/2001 5:14	0.478				
09/25/2001 9:23					
10/1/2001 7:21	0.03125				
10/12/2001 11:20	0.11				
10/16/2001 8:14	0.0574306				
10/26/2001 2:59	0.0208333				
10/26/2001 3:14	0.0208333				
10/26/2001 6:30	0.0208333				
10/27/2002 22:09	0.0089583				
10/28/2001 4:56	0.0416667				
10/28/2001 4:56	0.0055556				
10/28/2001 9:12	0.0208333				
10/29/2001 13:27	0.0333333				

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Following is actual data reported by Shell</b>					
Pilot and purge gas need to be added					
<b>LOP</b>					
Date/Time	Estimated Flow				
	(MMSCF)				
11/05/2001 20:53	0.0104167				Shell's reported data
11/05/2001 20:53	0.0104167				Shell's reported data
11/28/2001 17:34	0.009375				Shell's reported data
11/29/2001 14:21	0.009375				Shell's reported data
12/04/2001 12:46	0.0125				Shell's reported data
12/14/2001 0:00	0.226				Shell's reported data
12/20/2001 9:44	0.27				Shell's reported data
12/21/2001 15:44	0.0469				Shell's reported data
12/21/2001 16:58					Shell's reported data
12/22/2001 0:35,	0.0083333				Shell's reported data
12/22/2001 4:16	0.0083333				Shell's reported data
12/26/2001 18:09	0.0594				Shell's reported data
01/03/2002 8:34	0.0042				Shell's reported data
01/14/2002	1.06				Shell's reported data
01/14/2002	0.011				Shell's reported data
01/25/2002	0.026				Shell's reported data
04/03/2002	0.0164				Shell's reported data
04/09/2002	0.3035				Shell's reported data
04/09/2002	0.7156				Shell's reported data
04/13/2002 11:20	0.0668				Shell's reported data
05/11/2002 22:21	0.0188				Shell's reported data
05/19/2002 14:00	0.009				Shell's reported data
05/20/2002	0.0268				Shell's reported data
05/21/2002	0.241				Shell's reported data
06/22/2002 7:56	0.0149				Shell's reported data

<b>Following is actual data reported by Shell</b>				
Pilot and purge gas need to be added				
<b>LOP</b>				
<b>Date/Time</b>	<b>Estimated Flow</b>			
	(MMSCF)			
6/23 & 6/24/02	0.1027			Shell's reported data
06/26/2002	0.0103			Shell's reported data
06/26/2002	0.0212			Shell's reported data
06/26/2002	0.0079			Shell's reported data
06/27/2002 9:27	0.0208			Shell's reported data
				Shell's reported data
<b>OPCEN</b>				Shell's reported data
<b>Date/Time</b>	<b>Estimated Flow</b>			Shell's reported data
	(MMSCF)			
01/24/2001	0.0055			Shell's reported data
01/25/2001	0.0192			Shell's reported data
01/27/2001	0.0186			Shell's reported data
01/28/2001	0.0019			Shell's reported data
01/29/2001 10:16	0.0181			Shell's reported data
01/30/2001 8:54	0.0278			Shell's reported data
01/30/2001 10:47	0.0208			Shell's reported data
01/30/2001 16:32	0.0083			Shell's reported data
2/1/2001 8:14	0.0125			Shell's reported data
2/1/2001 9:43	0.0083			Shell's reported data
02/15/2001 9:38	0.025			Shell's reported data
02/21/2001 0:00	0.2296			Shell's reported data
02/23/2001 11:10	0.0167			Shell's reported data
9/01 1:30 pm to 3/20/01 1:30 pm	1.07			Shell's reported data
10/01 1:30 pm to 3/21/01 1:30 pm	1.15			Shell's reported data
04/09/2001 0:00	0.0337			Shell's reported data
04/21/2001 12:35	0.0278			Shell's reported data

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Following is actual data reported by Shell</b>					
Pilot and purge gas need to be added					
	<b>LOP</b>				
Date/Time	<b>Estimated Flow</b>				
	(MMSCF)				
08/22/2001 0:00	0.064				Shell's reported data
09/06/2001 14:54	0.0083				Shell's reported data
12/14/2001 13:30	0.0833				Shell's reported data
12/15/2001 13:38	0.0347				Shell's reported data
12/15/2001 13:41	0.0833				Shell's reported data
04/09/2001 14:59	0.2572				Shell's reported data
11/19/2001 14:00	0.0286				Shell's reported data
01/18/2001 0:00	0.006				Shell's reported data
01/05/2001 13:27	0.0278				Shell's reported data
01/05/2001 13:39	0.0278				Shell's reported data
01/27/2001 14:29	0.05				Shell's reported data
02/03/2001 10:08	0.1722				Shell's reported data
02/04/2001 7:40	0.0278				Shell's reported data
04/21/2001 7:25	0.0389				Shell's reported data
12/31/2001 9:00	0.6667				Shell's reported data
09/04/2001 10:45	0.0833				Shell's reported data
01/18/2001 15:42	0.0104				Shell's reported data
08/17/2001 17:34	0.0139				Shell's reported data
09/04/2001 10:45	0.012				Shell's reported data
11/15/2001 0:00	0.0069				Shell's reported data
12/20/2001 0:00	0.2083				Shell's reported data
12/31/2001 11:00	0.0313				Shell's reported data
12/15/2001 14:07	0				Shell's reported data
01/03/2002 14:01	0.1667				Shell's reported data
01/13/2002 0:00					Shell's reported data

<b>Following is actual data reported by Shell</b>					
Pilot and purge gas need to be added					
<b>LOP</b>					
Date/Time	<b>Estimated Flow</b>				
	(MMSCF)				
1/14/2002 0:00 FXU Wet Gas	0.3964				Shell's reported data
1/14/2002 0:00 FXU Propane	0.1108				Shell's reported data
1/15/2002 19:34 PIC 953 B	0.0056				Shell's reported data
1/17/2002 14:30 Dimer deprop tops	0.0391				Shell's reported data
1/17/2002 17:43 9F2522=0.10MM	0.0042				Shell's reported data
1/18/2002 5:19 9F2522=0.10MM	0.05				Shell's reported data
1/18/2002 14:16 9F2522=0.10MM	0.0333				Shell's reported data
1/19/2002 11:17 9F2522=0.10MM	0.0208				Shell's reported data
1/19/2002 15:56 9F2522=0.10MM	0.0417				Shell's reported data
01/21/2002	0.0775				Shell's reported data
1/23/2002 16:10 LPG TRUCK	0.019				Shell's reported data
01/24/2002 16:40	0.019				Shell's reported data
01/25/2002 16:51	0.019				Shell's reported data
01/26/2002 20:06	0.019				Shell's reported data
01/28/2002 0:14	0.019				Shell's reported data
01/29/2002 1:47	0.019				Shell's reported data
01/29/2002 16:05	0.0119				Shell's reported data
02/24/2002 12:53	0.0156				Shell's reported data
02/26/2002 10:08	0.0094				Shell's reported data
04/09/2002 12:15	0.0082				Shell's reported data
04/13/2002 11:16	0.0007				Shell's reported data
4/28 to 4/29/02					Shell's reported data
05/19/2002 8:19	0.0167				Shell's reported data
05/19/2002 9:38	0.0056				Shell's reported data
05/20/2002 0:00	0.0848				Shell's reported data

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Following is actual data reported by Shell</b>				
Pilot and purge gas need to be added				
	<b>LOP</b>			
<b>Date/Time</b>	<b>Estimated Flow</b>			
	<b>(MMSCF)</b>			
05/22/2002	0.0273			Shell's reported data
05/23/2002	0.05			Shell's reported data
06/04/2002	0.02			Shell's reported data
06/04/2002	0.0079			Shell's reported data
6/4 to 6/5/02	0.5625			Shell's reported data
06/25/2002	0.0156			Shell's reported data
				Shell's reported data
<b>Clean Fuels:</b>				Shell's reported data
<b>Date</b>		<b>Lbs HC</b>		Shell's reported data
		<b>Emitted</b>		Shell's reported data
01/16/2001		394		Shell's reported data
3/12-26/2001		10		Shell's reported data
03/19/2001		68		Shell's reported data
03/25/2001		150		Shell's reported data
04/02/2001		5		Shell's reported data
04/18/2001		61		Shell's reported data
04/21/2001		69		Shell's reported data
04/27/2001		0		Shell's reported data
07/17/2001		33		Shell's reported data
08/17/2001		1		Shell's reported data
09/04/2001		1		Shell's reported data
11/10/2001		0		Shell's reported data
Total flow rate: <b>2,824,315 scf</b>				Shell's reported data
				Shell's reported data
<b>Three Month Reporting Period:</b>	<b>Flow</b>			Shell's reported data

<b>Following is actual data reported by Shell</b>				
Pilot and purge gas need to be added				
	<b>LOP</b>			
<b>Date/Time</b>	<b>Estimated Flow</b>			
	(MMSCF)			
<b>SOURCE NAME &amp; NUMBER</b>	<b>RELEASE DATE &amp; TIME</b>	(MMSCF)		Shell's reported data
LOP Auxiliary Flare S#1471	12/21/2001			Shell's reported data
OPCEN Flare	01/13/2002	0.1100		Shell's reported data
LRGO (Clean Fuels) S#4201	03/22/2002			Shell's reported data
LRGO (Clean Fuels) S#4201	03/23/2002			Shell's reported data
	04/26/2002			Shell's reported data
	04/28/2002			Shell's reported data
	05/15/2002			Shell's reported data
	05/20/2002			Shell's reported data
				Shell's reported data
OPCEN S#1772	06/04/2002	0.0200		Shell's reported data
OPCEN S#1772	06/04/2002	0.0080		Shell's reported data
OPCEN S#1772	06/04/2002	0.6030		Shell's reported data
LOP	06/22/2002	0.0150		Shell's reported data
LOP	06/23/2002	0.0130		Shell's reported data
LOP	06/24/2002	0.0350		Shell's reported data
LOP	06/24/2002	0.0310		Shell's reported data
LOP	06/26/2002	0.0320		Shell's reported data
LOP	06/27/2002	0.0210		Shell's reported data
				Shell's reported data
				Shell's reported data
	July			Shell's reported data
LOP	07/09/2002	0.2000		Shell's reported data
LOP	7/18-19/2002	1.4000		Shell's reported data
Opcen	07/25/2002	0.0300		Shell's reported data

<b>Following is actual data reported by Shell</b>				
Pilot and purge gas need to be added				
	<b>LOP</b>			
<b>Date/Time</b>	<b>Estimated Flow</b>			
	(MMSCF)			
Opcen	07/29/2002	0.0003	Shell's reported data	
			Shell's reported data	
			Shell's reported data	
	August		Shell's reported data	
LOP	08/02/2002	2.5000	Shell's reported data	
	08/03/2002	0.2000	Shell's reported data	
	08/12/2002	1.6000	Shell's reported data	
	08/14/2002	0.0070	Shell's reported data	
	08/21/2002	0.0670	Shell's reported data	
OPCEN	08/03/2002	0.0010	Shell's reported data	
	08/13/2002	0.0200	Shell's reported data	
	08/14/2002	0.0048	Shell's reported data	
	08/21/2002	0.0450	Shell's reported data	
	08/21/2002	0.0001	Shell's reported data	
	08/21/2002	0.0750	Shell's reported data	
	08/21/2002	0.0200	Shell's reported data	
	08/22/2002	0.0280	Shell's reported data	

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	lbs
	5/4/01			3.46	456
	5/5/01			3.37	445
	5/6/01			3.98	525
	5/7/01			3.48	459
	5/8/01			3.8	501
	5/9/01			3.95	521
	5/10/01			3.81	503
	5/11/01			3.53	466
	5/12/01			4.17	550
	5/13/01			4.85	640
	5/14/01			5.49	724
	5/15/01			4.26	562
	5/16/01			3.37	445
	5/17/01			3.63	479
	5/18/01			3.59	474
	5/19/01			3.45	455
	5/20/01			3.49	460
	5/21/01			3.41	450
	5/22/01			3.51	463
	5/23/01			3.36	443
	5/24/01			3.43	453
	5/25/01			3.68	485
	5/26/01			3.89	513

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	<b>lbs</b>
	5/27/01			4.09	540
	5/28/01			4.09	540
	5/29/01			3.69	487
	5/30/01			3.49	460
	5/31/01			3.43	453
	6/1/01			3.83	505
	6/2/01			3.53	466
	6/3/01			3.36	443
	6/4/01			3.48	459
	6/5/01			3.61	476
	6/6/01			3.42	451
	6/7/01			3.73	492
	6/8/01			3.51	463
	6/9/01			3.49	460
	6/10/01			3.68	485
	6/11/01			4.08	538
	6/12/01			3.69	487
	6/13/01			3.58	472
	6/14/01			3.36	443
	6/15/01			3.42	451
	6/16/01			6.66	879
	6/17/01			4.17	550
	6/18/01			3.9	515
	6/19/01			3.92	517

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	lbs
	6/20/01			4.53	598
	6/21/01			13.271	1751
	6/22/01			11.19	1476
	6/23/01			11.78	1554
	6/24/01			11.16	1472
	6/25/01			11.77	1553
	6/26/01			19.35	2553
	6/27/01			25.73	3394
	6/28/01			14.31	1888
	6/29/01			15.9	2098
	6/30/01			18.74	2472
	7/1/2001			9.38	1237
	7/2/01			6.45	851
	7/3/01			7.1	937
	7/4/01			4.14	546
	7/5/01			3.97	524
	7/6/01			3.8	501
	7/7/01			3.91	516
	7/8/01			4.03	532
	7/9/01			10.4	1372
	7/10/01			12.62	1665
	7/11/01			3.94	520
	7/12/01			3.92	517
	7/13/01			3.8	501

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	<b>lbs</b>
	7/14/01			3.9	515
	7/15/01			3.8	501
	7/16/01			4	528
	7/17/01			3.76	496
	7/18/01			25.21	3326
	7/19/01			28.03	3698
	7/20/01			28.16	3715
	7/21/01			28.13	3711
	7/22/01			28.25	3727
	7/23/01			28.1	3707
	7/24/01			26.05	3437
	7/25/01			27.26	3596
	7/26/01			26.23	3460
	7/27/01			21.38	2821
	7/28/01			16.38	2161
	7/29/01			18.12	2391
	7/30/01			12.35	1629
	7/31/01			7.17	946
	8/1/01			14.21	1875
	8/2/01			12.09	1595
	8/3/01			17.02	2245
	8/4/01			20.37	2687
	8/5/01			15.45	2038
	8/6/01			3.87	511

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	<b>lbs</b>
	8/7/01			4.11	542
	8/8/01			5.25	693
	8/9/01			34.191	4511
	8/10/01			42.35	5587
	8/11/01			45.74	6034
	8/12/01			41.05	5416
	8/13/01			36.37	4798
	8/14/01			33.6	4433
	8/15/01			28.34	3739
	8/16/01			25.83	3408
	8/17/01			26.79	3534
	8/18/01			13.68	1805
	8/19/01			5.27	695
	8/20/01			8.37	1104
	8/21/01			10.2	1346
	8/22/01			13.54	1786
	8/23/01			5.69	751
	8/24/01			5.33	703
	8/25/01			11.48	1515
	8/26/01			8.67	1144
	8/27/01			9.52	1256
	8/28/01			9.28	1224
	8/29/01			19.23	2537
	8/30/01			31.74	4187

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	<b>lbs</b>
	8/31/01			33.64	4438
	9/1/2001			33.61	4434
	9/2/01			33.66	4441
	9/3/01			33.69	4445
	9/4/01			34.44	4544
	9/5/01			33.75	4453
	9/6/01			32.89	4339
	9/7/01			18.69	2466
	9/8/01			18.19	2400
	9/9/01			17.3	2282
	9/10/01			17.47	2305
	9/11/01			17.75	2342
	9/12/01			19.7	2599
	9/13/01			16.71	2204
	9/14/01			16	2111
	9/15/01			11.86	1565
	9/16/01			7.87	1038
	9/17/01			10.08	1330
	9/18/01			20.84	2749
	9/19/01			22.79	3007
	9/20/01			22.35	2949
	9/21/01			22.45	2962
	9/22/01			23.96	3161
	9/23/01			21.67	2859

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Shell Flexigas Flare					District's
					VOC Estimate
	DATE			FLEXIGAS TO FLARE	2% HC 25 MW 90% eff
				MMSCFD	lbs
	9/24/01			21.63	2854
	9/25/01			25.6	3377
	9/26/01			22.23	2933
	9/27/01			14.991	1978
	9/28/01			14.66	1934
	9/29/01			21.24	2802
	9/30/01			4.95	653
	10/1/01			4.19	553
	10/2/01			4.13	545
	10/3/01			4.03	532
	10/4/01			4.11	542
	10/5/01			4.22	557
	10/6/01			4.66	615
	10/7/01			9.49	1252
	10/8/01			14.86	1960
	10/9/01			18.52	2443
	10/10/01			23.63	3117
	10/11/01			22.25	2935
	10/12/01			25.65	3384
	10/13/01			29.08	3836
	10/14/01			29.11	3840
	10/15/01			25.38	3348
	10/16/01			14.43	1904
	10/17/01			22.31	2943

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	<b>lbs</b>
	10/18/01			31.41	4144
	10/19/01			27.07	3571
	10/20/01			31.25	4123
	10/21/01			30.48	4021
	10/22/01			34.43	4542
	10/23/01			32.13	4239
	10/24/01			32.03	4226
	10/25/01			31.8	4195
	10/26/01			28.12	3710
	10/27/01			18.93	2497
	10/28/01			17.94	2367
	10/29/01			25.17	3321
	10/30/01			23.18	3058
	10/31/01			15.1	1992
	11/1/2001			14.46	1908
	11/2/01			8.85	1168
	11/3/01			7.92	1045
	11/4/01			4.55	600
	11/5/01			5.59	737
	11/6/01			2.41	318
	11/7/01			3.29	434
	11/8/01			4.25	561
	11/9/01			2.09	276
	11/10/01			2.51	331

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	<b>lbs</b>
	11/11/01			2.1	277
	11/12/01			1.99	263
	11/13/01			2.19	289
	11/14/01			2.14	282
	11/15/01			2.671	352
	11/16/01			2.33	307
	11/17/01			2.5	330
	11/18/01			2.7	356
	11/19/01			2.71	358
	11/20/01			3.24	427
	11/21/01			3	396
	11/22/01			2.32	306
	11/23/01			2.35	310
	11/24/01			1.72	227
	11/25/01			3.26	430
	11/26/01			2.89	381
	11/27/01			3.38	446
	11/28/01			3.52	464
	11/29/01			3.68	485
	11/30/01			3.1	409
	12/1/01			2.87	379
	12/2/01			2.49	328
	12/3/01			3.33	439
	12/4/01			8.28	1092

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	<b>lbs</b>
	12/5/01			8.51	1123
	12/6/01			7.79	1028
	12/7/01			4.57	603
	12/8/01			5.14	678
	12/9/01			4.35	574
	12/10/01			5.78	763
	12/11/01			6.67	880
	12/12/01			3.81	503
	12/13/01			2.04	269
	12/14/01			1.65	218
	12/15/01			2.38	314
	12/16/01			1.42	187
	12/17/01			1.4	185
	12/18/01			1.86	245
	12/19/01			1.21	160
	12/20/01			1.42	187
	12/21/01			10.85	1431
	12/22/01			6.26	826
	12/23/01			10.14	1338
	12/24/01			6.41	846
	12/25/01			8.42	1111
	12/26/01			4.53	598
	12/27/01			3.24	427
	12/28/01			7.48	987

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	<b>lbs</b>
	12/29/01			5.84	770
	12/30/01			3.22	425
	12/31/01			30.26	3992
	1/1/2002			19.09	2518
	1/2/02			16.87	2226
	1/3/02			17.371	2292
	1/4/02			18.53	2445
	1/5/02			19.09	2518
	1/6/02			11.02	1454
	1/7/02			9.15	1207
	1/8/02			14.34	1892
	1/9/02			42.38	5591
	1/10/02			39.2	5172
	1/11/02			28.15	3714
	1/12/02			28.06	3702
	1/13/02			27.98	3691
	1/14/02			28.24	3726
	1/15/02			32.1	4235
	1/16/02			40.31	5318
	1/17/02			37.64	4966
	1/18/02			35.17	4640
	1/19/02			21.19	2796
	1/20/02			12.79	1687
	1/21/02			9.75	1286

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	<b>lbs</b>
	1/22/02			6.66	879
	1/23/02			7.12	939
	1/24/02			6.23	822
	1/25/02			3.03	400
	1/26/02			3.8	501
	1/27/02			3.9	515
	1/28/02			2.65	350
	1/29/02			5.97	788
	1/30/02			12.51	1650
	1/31/02			26.21	3458
	2/1/2002			24.77	3268
	2/2/02			20.86	2752
	2/3/02			13.34	1760
	2/4/02			12.86	1697
	2/5/02			7.63	1007
	2/6/02			6.22	821
	2/7/02			7.9	1042
	2/8/02			6.56	865
	2/9/02			7.66	1011
	2/10/02			6.04	797
	2/11/02			8.3	1095
	2/12/02			12.76	1683
	2/13/02			12.51	1650
	2/14/02			13.81	1822

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	<b>lbs</b>
	2/15/02			19.19	2532
	2/16/02			26.45	3489
	2/17/02			22.23	2933
	2/18/02			16.28	2148
	2/19/02			17.13	2260
	2/20/02			11.04	1456
	2/21/02			18.47	2437
	2/22/02			18.85	2487
	2/23/02			18.31	2416
	2/24/02			12.32	1625
	2/25/02			8.61	1136
	2/26/02			18.57	2450
	2/27/02			20.98	2768
	2/28/02			12.26	1617
	3/1/02			11.34	1496
	3/2/02			9.29	1226
	3/3/02			10.06	1327
	3/4/02			11.5	1517
	3/5/02			14.07	1856
	3/6/02			13.2	1741
	3/7/02			14.02	1850
	3/8/02			19.78	2609
	3/9/02			13.11	1730
	3/10/02			13.88	1831

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	lbs
	3/11/02			16.65	2197
	3/12/02			15.69	2070
	3/13/02			17.34	2288
	3/14/02			23.37	3083
	3/15/02			25.89	3416
	3/16/02			17.08	2253
	3/17/02			26	3430
	3/18/02			23.05	3041
	3/19/02			19.71	2600
	3/20/02			25.78	3401
	3/21/02			27.49	3627
	3/22/02			36.97	4877
	3/23/02			35.68	4707
	3/24/02			38.31	5054
	3/25/02			45.04	5942
	3/26/02			46.01	6070
	3/27/02			47.04	6206
	3/28/02			46.16	6090
	3/29/02			48.24	6364
	3/30/02			48.84	6443
	3/31/02			48.05	6339
	4/1/02			49.06	6472
	4/2/02			37.05	4888
	4/3/02			37.2	4908

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Shell Flexigas Flare					District's
					VOC Estimate
	DATE			FLEXIGAS TO FLARE	2% HC 25 MW 90% eff
				MMSCFD	lbs
	4/4/02			37.16	4902
	4/5/02			35.19	4642
	4/6/02			34.48	4549
	4/7/02			40.72	5372
	4/8/02			50.25	6629
	4/9/02			51.67	6817
	4/10/02			45.24	5968
	4/11/02			47.981	6330
	4/12/02			46.52	6137
	4/13/02			41.3	5449
	4/14/02			30.99	4088
	4/15/02			36.79	4854
	4/16/02			50.66	6683
	4/17/02			48.72	6427
	4/18/02			46.32	6111
	4/19/02			45.46	5997
	4/20/02			47.82	6309
	4/21/02			45.41	5991
	4/22/02			39.18	5169
	4/23/02			33.3	4393
	4/24/02			33.82	4462
	4/25/02			36.95	4875
	4/26/02			33.35	4400
	4/27/02			24.94	3290

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

---

<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	<b>lbs</b>
	4/28/02			22.67	2991
	4/29/02			19.56	2580
	4/30/02			27.87	3677
	5/1/02			29.78	3929
	5/2/02			26.39	3482
	5/3/02			21.45	2830
	5/4/02			21.85	2883
	6/1/02			153	20185
	6/2/02			153	20185
	6/3/02			153	20185
	6/4/02			153	20185
	6/5/02			153	20185
	6/6/02			153	20185
	6/7/02			153	20185
	6/8/02			153	20185
	6/9/02			153	20185
	6/10/02			153	20185
	6/11/02			153	20185
	6/12/02			153	20185
	6/13/02			153	20185
	6/14/02			153	20185
	6/15/02			153	20185
	6/16/02			153	20185
	6/17/02			153	20185

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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Shell Flexigas Flare					District's
					VOC Estimate
	DATE			FLEXIGAS TO FLARE	2% HC 25 MW 90% eff
				MMSCFD	lbs
	6/18/02			153	20185
	6/19/02			153	20185
	6/20/02			153	20185
	6/21/02			153	20185
	6/22/02			153	20185
	6/23/02			153	20185
	6/24/02			153	20185
	6/25/02			153	20185
	6/26/02			153	20185
	6/27/02			153	20185
	6/28/02			153	20185
	6/29/02			153	20185
	6/30/02			153	20185
	7/1/02			40	5255
	7/2/02			40	5255
	7/3/02			40	5255
	7/4/02			40	5255
	7/5/02			40	5255
	7/6/02			40	5255
	7/7/02			40	5255
	7/8/02			40	5255
	7/9/02			40	5255
	7/10/02			40	5255
	7/11/02			40	5255

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

---

<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	lbs
	7/12/02			40	5255
	7/13/02			40	5255
	7/14/02			40	5255
	7/15/02			40	5255
	7/16/02			40	5255
	7/17/02			40	5255
	7/18/02			40	5255
	7/19/02			40	5255
	7/20/02			40	5255
	7/21/02			40	5255
	7/22/02			40	5255
	7/23/02			40	5255
	7/24/02			40	5255
	7/25/02			40	5255
	7/26/02			40	5255
	7/27/02			40	5255
	7/28/02			40	5255
	7/29/02			40	5255
	7/30/02			40	5255
	7/31/02			40	5255
	8/1/02			24	3228
	8/2/02			24	3228
	8/3/02			24	3228
	8/4/02			24	3228

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

---

<b>Shell Flexigas Flare</b>					<b>District's</b>
					<b>VOC Estimate</b>
	<b>DATE</b>			<b>FLEXIGAS TO FLARE</b>	2% HC 25 MW 90% eff
				<b>MMSCFD</b>	<b>lbs</b>
	8/5/02			24	3228
	8/6/02			24	3228
	8/7/02			24	3228
	8/8/02			24	3228
	8/9/02			24	3228
	8/10/02			24	3228
	8/11/02			24	3228
	8/12/02			24	3228
	8/13/02			24	3228
	8/14/02			24	3228
	8/15/02			24	3228
	8/16/02			24	3228
	8/17/02			24	3228
	8/18/02			24	3228
	8/19/02			24	3228
	8/20/02			24	3228
	8/21/02			24	3228
	8/22/02			24	3228
	8/23/02			24	3228
	8/24/02			24	3228
	8/25/02			24	3228
	8/26/02			24	3228
	8/27/02			24	3228
	8/28/02			24	3228

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

---

Shell Flexigas Flare						District's
						VOC Estimate
	DATE			FLEXIGAS TO FLARE		2% HC 25 MW 90% eff
				MMSCFD		lbs
	8/29/02			24		3228
	8/30/02			24		3228
	8/31/02			24		3228

Notes: Data supplied by Shell except for last column which is the District's emission estimate  
based on information supplied by Shell

Average daily value for reported data for Flexigas is                   2       tons

Maximum reported value for  
Flexigas (6/1/02 to 6/30/02) is                   10       tons

### **Appendix 3: Synopsis Of Published Studies**

Prior to 1980 there was limited work on the emission analysis of the flare combustion reaction. In the early eighties a task group consisting of the Chemical Manufacturers Association, the John Zink Company and EPA was formed to formulate plans to undertake a comprehensive flare efficiency study. The purpose of the jointly funded tests was to measure fugitive VOC emissions for comparative ranking of flares with other reasonable available control technology.

Tests with crude propylene simulated normal daily purge and relief rates for high smoking tendency, high heating value hydrocarbons. Secondary waste gas compositions were obtained by blending nitrogen with the propylene. These secondary gas compositions were representative of normal flaring practice where vessels and heaters are purged with nitrogen. Flow rates were selected to cover the range of normal daily flaring occurrence.

Thirty-two separate flare operating conditions were tested. Flare performance was evaluated in terms of the combustion efficiency determined by extractive sampling. Extractive sampling data provides the average combustion efficiency, standard deviation, number of observations and background data. For the 32 tests, 3,121 operating points were logged. Flow data for propylene, nitrogen and steam were reported as the average value for the test duration.

For the seven tests using steam assist for the smokeless burning of crude propylene, the average combustion efficiency was 99.83%. This same mixture flared without steam showed the average combustion efficiency for nonsmokeless flaring was 98.58%. The average combustion efficiency for mixed gasses (300Btu/scf) was 99.5% without steam and 99.75% with steam. The average combustion efficiency when relief gas flow simulated nitrogen purging (220Btu/scf - 150Btu/scf with and without steam) was 99.4% without steam and 99.0% with steam. Tests with air assisted flares showed the average combustion efficiency exceeding 99%.

These tests show that it is possible to quench the flame by excessive steam injection or by operating the flare at excessive relief gas exit velocities. Good engineering practice of flare design and application, though, can eliminate or minimize operational excursions beyond the limits of efficient hydrocarbon destruction. (Keller and Noble) A conclusion in their article states that the existing state of sampling technology does not lend itself to practical field measurements of emissions.

In May of 1984 EPA published a project summary titled Flare Efficiency Monitoring by Remote Infrared Sensing: A Feasibility Demonstration. A procedure was developed by which carbon monoxide and carbon dioxide concentrations could be determined from infrared emissions arising from the

gaseous exhaust product of a small scale industrial flare, and the results used to estimate flare efficiency. Two significant results were that in comparison to simultaneous extractive probe measurements (taken during the above study) indicate comparable CO and CO<sub>2</sub> concentrations (10%-30%), but significantly different temperature (2-4 times) and the most serious uncertainties are the spatial distributions of temperature and gas concentrations, and the detectability of hydrocarbon species.

In 1996 BP Oil Technology Centre, Stratoil and Spectrasyne Ltd published results of what they believed to be the first time that the Differential Absorption Lidar remote sensing technique was used successfully for flare emissions. The system, which is the light analogy of radar, was used at three refineries (in Sweden & Norway) with flare tips at 42 and 48 inches, flow rates ranging from 0.9 to 11 tons/hr and wind speeds from 2 to 17 meters/second.

The results show significant scatter in the data attributed to the fact that species concentrations were relatively close to the limit of detection but fluctuations in wind speed and flare conditions and difficulties in flow metering also played a part. The most significant conclusion was that under all the conditions tested the total methane and C<sub>2</sub>-C<sub>6</sub> alkane emissions represented less than 0.4 percent of the carbon in the flare gas for two of the flares and less than 0.7 percent for the other.

There have been other studies on remote sensing of gas emissions from flares. The Shell Research and Technology Centre along with German Aerospace Centre, Institute of Planetary Exploration, and the Fraunhofer Institute for Atmospheric Environmental Research published their work on natural gas flares in 1998. The use of fourier-transform infrared spectroscopy, where the thermal self-radiation of warm gas layers is measured, has a major advantage in that a simultaneous analysis of numerous species is realized from one measurement.

Some of their results show that flames of off-gasses achieve more complete combustion than flames with purified purge gas only and that the combustion efficiency of natural gas flares is approximately 99.5%.

Other field tests include the work by Ozumba and Okoro, Shell Petroleum Development Company in Nigeria. Eight flares, four solution gas flares and four gas plant flares, were measured using FTIR to determine combustion efficiency. Their results showed combustion efficiency > 98%.

During the time of the BP study, work on flares was ongoing in Canada. The Alberta Research Council published the test results on two production flares. The results indicated a flare efficiency of 62%-71% for sweet solution gasses and 84% for sour gasses. Simultaneous work on lab and pilot scale flames and its combustion efficiency under varying conditions was published in 1996. One of the most significant papers published the work performed on Efficiency Measurements of Flares in a Cross Wind. The results indicate that efficiency can be as low as 40%.

The limitation of this work is the scaling factor. Currently information that would allow their results to be scaled up to full-scale flares is not available. The tests were performed on small (> 14 inch) open pipe flares without steam. The ability to correlate the results with large scale flares is now the focus of their future study. The 2000 report contains 39 recommendations to reduce flaring.

McGready (Dow Chemical Company) states that operational factors such as low heat content, high or low exit velocity, and high wind speed can significantly reduce flare efficiency. In his paper titled "Industrial Flares: Linking Plume Dispersion with Combustion" he presents an experimental model for evaluating the reduction in flare efficiency that may occur due to high wind speed.

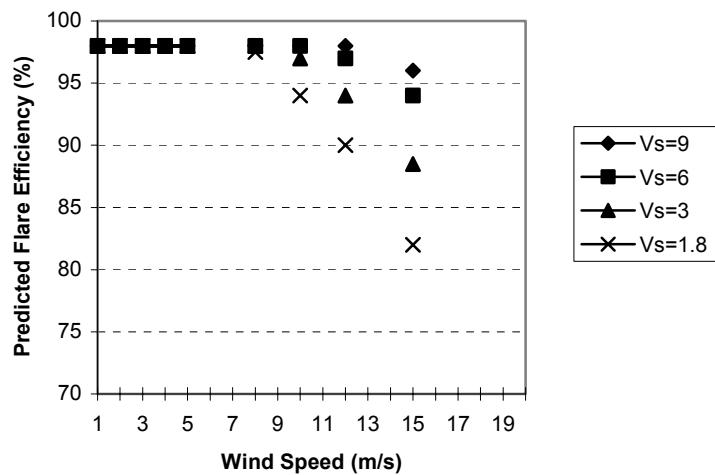


Figure 5

Figure 5 presents the predicted flare destruction efficiency as a function of flare tip exit velocity and wind speed. For this example, the flare efficiency remains at the rated 98% until the wind speed approaches 8 m/s; then the efficiency for exit velocity of 1.8 m/s decreases dramatically to 82% for a 15 m/s wind speed. Hydrocarbon destruction efficiency considers the fraction of hydrocarbons in the waste gas that is destroyed by combustion. Combustion efficiency considers the fraction of hydrocarbons that is completely converted to carbon dioxide and water. The hydrocarbon destruction efficiency may be higher than the combustion efficiency. Hydrocarbons in the waste gas may be destroyed but not completely converted to carbon dioxide: carbon monoxide and other carbon containing combustion by-products may be formed. The bulk of the incompletely combusted material will be carbon monoxide, as it is the most stable intermediate. (Lee, Environmental Technology Group Union Carbide Corp)

The two tables below were reproduced from an article in the Air & Waste Management Association Journal titled "Characterization of Emissions from Diffusion Flare Systems", by Mel T. Strosher of the Alberta Research Council.

**Volatile hydrocarbons identified in emissions from a natural gas flame containing 23% condensate vapor, in crosswinds using the multiprobe and hood samplers (mg/m<sup>3</sup>).**

Compounds	Probes (distance from vertical center in mm)			Hood (dia. mm)		
	150	75	0	75	150	300
PENTANE	1.45	2.18	3.69	2.22	1.15	4.11
3-PENTEN-1-YNE	2.14	2.98	2.97	2.33	1.71	3.16
HEXANE	2.61	3.11	6.81	2.79	1.36	5.81
CYCLOHEXANE	1.85	2.28	4.69	1.91	1.61	4.60
BENZENE	40.23	47.10	74.35	51.45	34.39	86.04
PENTANE, 3,3-DIMETHYL-	10.52	14.36	25.43	14.49	7.13	24.15
HEXANE, 3-METHYL-	7.60	11.47	17.24	9.26	5.18	17.39
CYCLOPENTANE, 1,2-DIMETHYL-	5.43	6.77	12.11	3.69	3.05	13.48
HEPTANE	57.54	70.49	95.66	65.19	28.06	120.67
CYCLOHEXANE, METHYL-	16.35	21.19	34.23	13.40	8.44	44.41
BENZENE, METHYL-	34.97	47.47	71.83	51.33	39.99	82.36
1-HEXENE, 2,5-DIMETHYL-	19.60	24.45	34.67	20.64	14.01	2.6.85
CYCLOHEXANE, 1,3-DIMETHYL-, CIS-	1.55	3.22	11.34	5.21	3.80	13.32
OCTANE	70.27	117.30	208.93	115.45	50.61	188.43
HEXANE, 3-ETHYL-	1.50	8.33	11.42	8.23	3.62	12.36
CYCLOHEXANE, ETHYL-	11.32	18.83	25.30	17.85	14.89	24.50
HEPTANE, 3,4-DIMETHYL-	14.50	19.88	20.77	16.67	12.97	20.78
CYCLOHEXANE, 1,2,4-TRIMETHYL-	1.83	3.70	7.09	3.96	3.52	7.55
BENZENE, ETHYL-	13.16	16.72	35.85	19.67	14.11	47.86
CYCLOPENTENE, I-ETHENYL-3						
-METHYLENE-	50.30	63.03	85.90	62.60	48.50	71.40
2H-PYRAN-2-ONE, TETRAHYDRO-						
6,6-DIMETHYL-	25.19	31.10	38.61	36.68	28.96	43.22
CYCLOHEXANE, 1,3,5-TRIMETHYL-	6.13	9.40	16.02	13.32	5.84	15.93
BENZENE, 1,4-DIMETHYL-	25.19	26.95	37.11	27.67	22.21	39.93
NONANE	89.16	117.64	154.84	88.96	70.37	131.96
BENZENE, ETHYNYL-	4.21	6.25	9.46	5.79	3.27	15.74
BENZENE, ETHENYL-	8.00	12.22	18.14	13.56	6.33	22.49
NONANE, 3-METHYL-	15.36	16.49	21.23	17.25	8.24	23.96
BENZENE, I-ETHENYL-2-METHYL-	7.29	11.16	18.13	9.79	6.71	19.21
BENZENE, PROPYL-	20.78	22.38	34.30	12.63	12.49	29.24
BENZENE, (1-METHYLETHYL)-	17.22	25.07	35.01	19.67	14.30	25.17
BENZENE, i-ETHYL-2-METHYL-	12.04	18.31	29.13		19.38	
	13.73	20.44				
OCTANE, 2,6-DIMETHYL-	7.91	13.35	19.44	13.67	6.64	23.70
BENZENE, 1,3,5-TRIMETHYL-	8.98	14.26	15.85	7.88	4.80	21.13
CYCLOPENTANE, 1-METHYL-3-						
(2-METHYLPROPYL)-	3.15	7.61	8.25	6.74	3.60	10.40
BENZENE, 1,2,4-TRIMETHYL-	10.39	15.24	20.84	17.38	12.46	20.97
DECANE	64.96	89.61	127.93	73.60	45.19	102.11
BENZENE, DIETHYL-	3.75	3.80	6.78	5.56	1.64	7.10
NONANE, 4,5-DIMETHYL-	1.27	2.41	5.62	4.61	1.32	4.68
BENZENE, 1 -METHYL-2-PROPYL-	6.60	11.63	15.07	9.08	5.20	19.06
CYCLOHEXANE, (2-METHYLPROPYL)-	9.87	10.37	16.44	11.40	7.60	18.69
DECANE, 3-METHYL-	2.26	2.84	3.98	2.59	1.93	4.06
BENZENE, I-ETHYL-2,3-DIMETHYL-	16.79	24.43	24.75	18.85	15.09	20.71

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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BENZENE, METHYL(I-METHYLETHYL)-	3.66	5.51	12.21	9.69	4.05	18.78
BENZALDEHYDE, 4-METHYL-	4.79	5.44	12.64	8.71	4.73	10.37
BENZENE, 1,2,3,4-TETRAMETHYL-	2.40	3.69	9.66	7.57	2.64	8.88
BENZENE, 1,2,3,5-TETRAMETHYL-	4.16	5.49	9.54	6.02	2.69	12.87
BENZENE, 4-ETHYL-1,2-DIMETHYL-	15.29	22.94	32.88	29.63	15.31	31.77
UNDECANE -	1.71	2.59	3.67	2.31	1.77	2.36
BENZENE, 1,2,4,5-TETRAMETHYL-	0.66	0.60	1.67	0.78	0.82	1.78
BENZENE, 1-METHYL-4-(I-METHYLETHYL)-	0.91	1.35	1.65	1.47	1.29	1.92
BENZENE, (1,1-DIMETHYLPROPYL)-	0.88	1.01	2.11	1.65	0.71	1.87
BENZENE, (1-ETHYLPROPYL)-	0.60	0.84	2.17	1.39	0.70	1.75
BENZENE, 1,3-DIETHYL-5-METHYL-	0.87	0.86	1.68	1.18	0.39	1.74
NAPHTHALENE	27.21	46.22	61.88	38.05	25.18	79.95
DODECANE	1.94	3.74	7.86	3.99	1.65	7.40
NAPHTHALENE, 2-METHYL-	5.32	8.15	11.84	6.74	3.20	12.90
NAPHTHALENE, 1-METHYL-	1.55	5.83	6.69	3.42	2.61	7.84
1,1'-BIPHENYL	2.36	5.45	6.47	3.27	2.47	6.14
BIPHENYLENE	1.93	4.20	5.00	2.96	2.72	6.67
ACENAPHTHYLENE	1.62	3.13	3.78	2.23	1.73	3.88
9H-FLUORENE, 9-METHYLENE-	0.91	2.08	3.16	2.01	1.22	3.21

**Semi-volatile hydrocarbons identified in emissions from a natural gas flame containing 23% condensate vapor, in crosswinds ( $\mu\text{g}/\text{m}^3$ ).**

Compound	Amount
BENZENE, 1-METHYL-2-(PHENYLMETHYL)-	825.5
BENZENE, 1-METHYL-4-(PHENYLMETHYL)-	278.4
NAPHTHALENE, 1,4,6-TRIMETHYL-	380.4
9H-FLUORENE	541.6
BENZENE, 1,1'-METHYLENEBIS[4-METHYL-	431.1
1, 1 '-BIPHENYL, 2-ETHYL-	661.3
BENZENE. I-METHYL-2-[(3-METHYLPHENYL)METHYLI-	617.5
BENZENE, I-METHYL-3-[(4-METHYLPHENYL)METHYLI-	648.1
9H-FLUORENE, 9-METHYLENE-	1660.0
9H-FLUORENE. I-METHYL-	398.7
9H-FLUORENE. 2-METHYL-	353.4
ANTHRACENE	957.8
9H-FLUORENE, 2,3-DIMETHYL-	1070.0
BENZENE, I-METHYL-3-(2-PHENYLETHENYL)-, (E)-	94.2
BENZENE, 1-METHYL-2-(2-PHENYLETHENYL)-	125.3
1,1'-BIPHENYL, (1--METHYLETHENYL)-	92.9
PHENANTHRENE, 3-METHYL-	774.2
ANTHRACENE. 2-METHYL-	929.4
4H-CYCLOPENTA[DEF]PHENANTHRENE	471.9
PHENANTHRENE, 2-METHYL-	363.7
PHENANTHRENE, 2,5-DIMETHYL-	583.9
PHENANTHRENE, 3,6-DIMETHYL-	716.8
PHENANTHRENE, 2,3-DIMETHYL-	221.9
FLUORANTHENE	526.9
NAPHTHALENE, 2-(PHENYLMETHYL)-	94.8
BENZENE, 1,1'-(1,3-BUTADIYNE-1,4-DIYL)BIS-	236.5
PYRENE	825.0
PHENANTHRENE, 2,3,5-TRIMETHYL-	451.3
11H-BENZO(A)FLUORENE	96.2
LIH-BENZO[B]FLUORENE	230.3
PYRENE, 2-METHYL-	130.7

**DRAFT TECHNICAL ASSESSMENT: POTENTIAL CONTROL STRATEGIES  
TO REDUCE EMISSIONS FROM FLARES**

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2,5-CYCLOHEXADIENE-1,4-DIONE, 2,5-DIPHENYL-	2480.0
CHRYSENE	131.3
TRIPHENYLENE	183.1
BENZENE, 1,2-DIPHENOXY-	94.7
BENZENE, 1,4-DIPHENOXY-	101.4
BENZO[BITHIOPHENE, 3-(2-NAPHTHAENYL)-	667.8
BENZOIE]PYRENE	219.8
BENZO[A]PYRENE	346.1